

NATIONAL EPA-TRIBAL SCIENCE COUNCIL

National Forum On Tribal Environmental Science

CONFERENCE PROCEEDINGS AND EXECUTIVE SUMMARY



SEPTEMBER 24 – 28, 2006

HOSTED BY Quinault Indian Nation (QIN)
Ocean Shores, Washington



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Preface

The National Forum on Tribal Environmental Science was sponsored by [the National EPA–Tribal Science Council \(TSC\)](#) and hosted by the [Quinault Indian Nation \(QIN\)](#). It was the first conference of its kind. The conference was held from September 24 – 28, 2006 at the [Quinault Beach Resort](#) in Ocean Shores, Washington. Tribes from across Indian country, tribal organizations, tribal faculty and students, representatives of EPA, and other federal agencies were invited to participate. The conference theme was “Tribal Science Priorities and Success Stories.”

The Conference was structured around the concept of the Circle of Life, or Medicine Wheel, a powerful symbol that has many meanings to the Native Nations and Tribes across America. Four knowledge tracks -- Air, Water, Earth, and Community Health -- aligned to four directions of the Circle provided the basic concepts around which participants shared western and traditional Tribal knowledge. The Conference included a full range of activities:

- ◆ Scientific presentations
- ◆ Intensive professional trainings
- ◆ Poster presentations
- ◆ Local field trips
- ◆ Film screenings
- ◆ Networking sessions, and
- ◆ Tribal presentations.

In the pages that follow, the results of this coming together and sharing of knowledge are documented. All sections of this summary report offer insight into the National Forum on Tribal Environmental Science. The Executive Summary gives a comprehensive overview of the entire conference including background on the TSC and discussion of how the conference was planned and organized. This preface is followed by a summary of the conference highlighting significant results and substantial questions that arose during technical and training sessions; the summary report also embodies reflections on the broad themes that emerged as a result of the interaction and collaboration of all the conference activities. The table of contents contains a chronological listing of all conference activities according to the daily schedule and conference tracks. Each listing includes session title, name(s) of presenter(s), and affiliation(s).

Those who wish to obtain additional information about the specific presentations and trainings as well as descriptions of the extracurricular activities can access:

<http://www.epa.gov/osp/tribes/announce/National%20Forum.htm>. A list of acronyms that appear throughout this document is provided as reference. Appendices include: A) the conference agenda, B) a final participant list with affiliation and contact information, and C) biographies of speakers.

The purpose of this document is to provide a record of the conference proceedings but also to provide a vehicle for disseminating lessons learned to a broader audience and to encourage those who participated in the conference to continue their collaborations. This summary report attempts to capture as much of what occurred as possible, given the limits of its form. Ancillary materials, such as presentation slides, information available on the TSC website and other websites, and resources cited throughout this report, can be accessed in this report.

Acknowledgements

National EPA-Tribal Science Council

Tribal Representatives

Co-Chair: Curtis Munoz, Kiowa Tribe, Region 6

Daniel Kusnierz, Penobscot Nation (Region 1)

Tony David, St. Regis Mohawk Tribe (Region 2)

Michael Bolt, Eastern Band of Cherokee Nations (Region 4)

Christine Berini, Fond du Lac Band of Lake Superior Chippewa (Region 5)

Curtis Munoz, Kiowa Tribe (Region 6)

Denise West, Winnebago Tribe of Nebraska (Region 7)

Richard Janssen, Confederated Salish and Kootenai Tribes (Region 8)

Cheung, Marshall, 29 Palms Band of Mission Indians (Region 9)

Moses D. Squeochs, Fourteen Confederated Tribes and Bands of the Yakama Nation (Region 10: Idaho, Oregon, and Washington)

Harold Frank, Jr., Central Council of Tlingit and Haida Indian Tribes of Alaska (Region 10: Alaska Native)

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Elizabeth Jackson, Office of Environmental Information

Elizabeth Resek, Office of Prevention, Pesticides, and Toxic Substances

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Patti Tyler, Region 8

Michele Dineyazhe, Region 9

Dana Davoli, Region 10

Executive Secretary

Monica Rodia, Office of Research & Development

Many thanks to all of the speakers, presenters and trainers who participated in the first National Forum on Tribal Environmental Science, and whose work is profiled in this document. The Tribal Science Council would also like to thank the over 100 Tribes that attended the conference from across the regions. A special thanks to the Quinault Indian Nation for hosting the conference, EPA program and regional offices and the American Indian Environmental Office for supporting this effort.

NATIONAL FORUM ON TRIBAL ENVIRONMENTAL SCIENCE

CONFERENCE PROCEEDINGS and EXECUTIVE SUMMARY

This report was prepared by the National-Environmental Protection Agency (EPA) Tribal Science Council. It is a documentation of the proceedings that occurred during the National Forum on Tribal Environmental Science, September 23-28, 2006 in Ocean Shores, WA. The report itself contains environmental research highlighting tribal success stories, summaries of panel discussions, speeches and notes from the plenary sessions

Copies of the report can be obtained from: <http://www.epa.gov/osp/tribes.htm>

Disclaimer: The views expressed in this report do not represent those of the United States Environmental Protection Agency, but strictly those of the presenters and researchers.

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David Charters, US EPA, Region 2, Edison, NJ

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Executive Summary

From September 24 – 28, 2006 over 300 attendees representing more than 125 Indian tribes and Alaska native villages, intertribal consortia, tribal environmental organizations, academic institutions, and federal, state, and local governments, as well as private and non-profit organizations from every region in the country gathered at the Quinault Beach Resort in Ocean Shores, Washington to attend the first National Forum on Tribal Environmental Science. American Indian and Alaska Native leaders and professionals from 111 tribes participated in the forum. The theme of the conference “Tribal Science Priorities and Success Stories” was explored in four tracks: Air, Water, Earth and Community Health. The Forum was sponsored by the National EPA–Tribal Science Council (TSC) and hosted by the Quinault Indian Nation (QIN).

Background

The Tribal Science Council (TSC) was formed in response to a request in 1999 from the National Tribal Caucus to provide a cross-agency forum to discuss national tribal priority science issues and identify the most appropriate ways to address these issues. The TSC coordinates with the National Tribal Caucus to integrate science priorities into the EPA’s annual planning and budgeting process. The TSC is comprised of scientists educated in western science as well as those trained in tribal traditional knowledge that is vital to addressing environmental health concerns of tribal communities.

The TSC is made up of EPA representatives from each program and regional office and a Tribal representative from each region. Tribal representatives to the TSC work within their Regional Tribal Operations Committees and EPA Regions to identify tribal science priorities. The development of these priorities allows for an understanding of tribal issues and related EPA activities, collaboration on solutions, and consideration of the Agency’s planning process.

The TSC published “National Tribal Science Priorities” in April 2006. These priorities provide an update to the first set of priorities identified by the TSC in September 2002. The priorities included in the 2006 document are: (1) endocrine disrupting chemicals; (2) dioxin and dioxin-like compounds; (3) persistent bioaccumulative toxics source reduction; (4) pharmaceuticals in wastewater; (5) habitat loss; (6) environmental triggers for respiratory distress with special emphasis on mold; (7) contaminated precipitation; and (8) biological stressors. The document provides a description of the area of concern, current efforts to address the issue, and recommendations for future action. In addition, examples are provided of where tribal impacts are unique felt as a result of the issue.

The document also provides background information on the evolution of the tribal science priorities from the original 2002 priorities to the current list and places the priorities in the context of three sets of considerations for each of the priorities:

- Tribal traditional lifeways
- Environmental decision-making processes
- Cross-priority activities
 - Exposure and impact

- Education
- Research
- Environmental Justice
- Restoration

The National Forum on Tribal Environmental Science was conducted as a result of the recommendations in *National Tribal Science Priorities* and viewed as an opportunity to further explore the above described priorities and share specific concerns and success stories with a broader audience.

Conference Overview

The National Forum on Tribal Environmental Science was structured around the Four Directions of the Circle of Life, or Medicine Wheel. From the Four Directions, Native and non-Native scientists converged to share their knowledge of Air, Water, Earth, and Community Health. They came together to keep the Circle of Life and the environment it encompasses clean and pure for all generations. In each of the conference tracks there were a variety of activities in which participants engaged in sharing knowledge, building new connections, and strengthening existing ties and vision.

The conference agenda included scientific presentations, intensive professional trainings, poster presentations, local field trips, film screenings, networking sessions, and tribal presentations and ceremony. Exhibitors included local artists and craftspeople (selling jewelry, baskets, and other traditional items) as well as federal, state, and tribal organizations and agencies with environmental and scientific information.

The conference opened Sunday evening with a banquet and welcoming celebration hosted by the Quinault Nation. The event was well-attended and set an upbeat tone for the conference. In addition to formal welcomes from the President and Vice Chair of the Quinault Indian Nation, attendees at the banquet were treated to a performance of traditional song and dance by the Quinault and Queets Canoe Societies.

Opening ceremonies continued Monday morning with a prayer offered by Quinault Elder Dennis Martin. Representatives of the Quinault Indian Nation -- Fawn Sharp, President, Guy Capoean, Vice Chair, and Larry Workman, Manager of Centralized Communication, welcomed all those in attendance and shared information about the land, history and future plans of the Quinault people. Roland Hemmet and David Nelson, Co-chairs of the TSC, gave a brief introduction and overview of goals for the coming days stressing that tribes and EPA must come together to integrate one another's knowledge to maintain clean air, water and tribal land.

The keynote speech was delivered by Oren Lyons, of the Onondaga Nation Council of Chiefs of the Six Nations of the Iroquois Confederacy. The impact of global climate change was a major focus of Mr. Lyons' talk. He explained how sacred teachings of Six Nations are relevant to all people in relation to this crisis:

“The Great Peacemaker's laws must not be challenged, but nations today are challenging these laws and one of the results is global warming. Although people are insignificant in terms of the earth, they have been able to cause systemic change. The Great Peacemaker instructed the leaders to make all decisions with the seventh generation in mind, so that this generation too will have a sustainable life. The responsibility of all life is in the leaders' hands. Leaders must understand the problems before they can find a solution. The problem must be examined and explored.”

The opening plenary followed, with initial remarks delivered by Lydia Olympic of the Igiugig Village Council, in Igiugig, Alaska. She described why the observations of her people in a small Alaskan village were vitally important to all those at the conference, saying, “Alaska Native people are still intimately connected to the land. We know that something is wrong. The environment is not healthy, and it is a matter of life and death for us and for the animals. The stories of Alaska Native people need to be told, and they need to be heard. If the world is ready to listen to indigenous people -- who know and understand the rhythm of the earth -- and act on this knowledge, then the earth’s balance can return.”

American Indians Alaska Natives Climate Warming Working Group: A Red Paper was the title of the plenary panel discussion. Daniel R. Wildcat of Haskell Indian Nations University, Margaret Hiza-Redsteer of USGS, Earth Surface Processes, and Roberto Gonzalez-Plaza, of Northwest Indian College were the panelists. These speakers shared vivid details of how their local climate is changing and the problems their communities are facing as a result. Their comments underscored the need for ongoing communication and collaboration between Native and non-Native scientists and local experts to record and respond to these issues. “Although global warming is especially apparent in Alaska, if we pay attention, changes can be seen everywhere. It is necessary to collect accurate data so that tribal leaders can make informed decisions regarding the future. This conference is the place to make key relationships and to make things happen,” said Dr. Wildcat.

Margaret Hiza-Redsteer, a resident of the Navajo Nation as well as a member of the U.S. Geological Survey, spoke about the need for training young Native American scientists and ensuring that there are resources available to fund their work on reservations after they have completed their education. The input of Native scientists is especially important she said, because, “Native American traditional observations are science; therefore, science is not a new concept to Native American nations. Sixty percent of the world’s food crop and 80 percent of the world’s medicines are the products of Native American science. Native American culture is based on observation. So is science. We need to pay attention to the signs all around us.”

Roberto Gonzalez-Plaza went on to say that, “global warming is human driven, and the changes as a result of this phenomenon are happening fast; humankind has become a geophysical force and everyone should understand the urgency of the need to act to deal with changes already underway.” He invited conference participants to contact any of the panel speakers to find out about becoming a member of the American Indians Alaska Natives Climate Warming Working Group. This ended the plenary activities for the day.

Monday afternoon, conference participants were invited to take a tour sponsored by the Quinault Indian Nation of either the coastal area or the rainforest. Both tours included a historical drive and opportunities to enjoy the beautiful surroundings at the beach or in the forest, as well as scientific presentations and tours of the local fishing industry. In addition to offering participants an opportunity to get to know one another in more informal settings, these tours brought home to everyone the purpose of the conference – to ensure that the beauty and abundance of the land continues.

Tuesday and Wednesday the conference was devoted to a combination of concurrent scientific sessions, panel presentations, and professional trainings scheduled at 8am, 10am, 1pm and 3pm divided into four tracks: Air, Water, Earth and Community Health. Sessions, panels, and trainings were offered in the following broadly defined areas:

Sessions

- Air Pollution Transport
- Air Deposition
- Indoor Air Issues

- Habitat Loss
- Invasive Species
- Water Quality Assessment Techniques
- Water and Community Health
- Food and Community Health
- Culture and Community Health
- Impacts of Climate Change in Earth, Air, Water
- Heavy Metal Contaminants in Earth, Air, Water
- Remediation Success Stories
- EPA and USGS Support for Tribal Environmental Science

Panels

- How Can Tribal Colleges And Tribal Government Environmental Programs Work Together for the Benefit of Their Communities?
- Cultural Sustainability Models: Using Our Ways of Knowing in Management and Group Discussion

Trainings

- Risk Assessment and EPA/Tribal Case Studies
- Data Management For Water Monitoring
- Overview of Science Grants And Tips For Successful Tribal Proposals
- Overview of Water Quality Standards From A Tribal Perspective
- Quality Assurance Project Plan Development Tool
- Overview of Quality Assurance Tools – Turbo QAPP
- Methamphetamine Lab Hazard Assessment Overview
- Introduction to Natural Resources Damage Assessment and Restoration
- Emergency Preparedness and Response

Question and answer periods were an important part of all sessions and provided a venue for lively dialogue among participants and presenters. Consequently, constructive conversations emerged and hard questions were raised that bode well for addressing problems that often arise from cultural differences and/or poor communication between parties.

During each evening of the Conference there were additional opportunities for networking and learning. These events were generally well attended and appreciated by participants. The events on Monday night focused on an informal poster presentation; posters were displayed and presenters were available to answer questions and discuss their topics with those in attendance. One of the goals of this session was to give students and young professionals an opportunity to present their work.

On Tuesday night Northwest Indian College (NWIC) introduced the development of its Bachelors Degree program in environmental science and sought input from conference attendees on its program goals, structure, and content. There were approximately 60 people at the event, mainly Native environmental personnel from tribes and the federal government as well as Native graduate students. It was a productive evening from which NWIC took away many insightful questions and comments.

Wednesday night featured screenings of two films. *Homeland: Four Portraits of Native Action*, directed by Roberta Grossman and produced by The Katahdin Foundation, is a documentary film that tells the story of Native American activists fighting to preserve their land, sovereignty, and culture. *Alaska Native Diet: Monitoring For Contaminants In Rural Alaska*, produced by Aleutian Pribilof Islands

Association, Inc. and World Turtle Productions, covered several topic areas including: sources of contaminants, pathways of contaminants to the Arctic and rural communities, and the role of the Alaska Native Traditional Food Safety Monitoring Program as a tool that Alaska and Kamchatka Natives can use to better monitor and understand diet and the levels of contaminant exposure.

Thursday was the final day of the conference. Scientific and training sessions were offered at 8am and 10am. After lunch, the rest of the day was devoted to the closing plenary sessions and ceremonies.

Cultural Sustainability Models: Using Our Ways of Knowing in Management and Group Discussion was the first plenary. Claudia Walters, US EPA, Office of Research & Development, Sustainability Programs, James Ransom, Tribal Chief, St. Regis Mohawk Tribe, Terry Williams, Director, Fisheries Department, Tulalip Tribes Natural Resources, Mary Arquette, Mohawk Tribe, Akwesasne Freedom School, and Preston Hardison, Tulalip Tribes Natural Resources were the panelists.

Each of these speakers reiterated the call to action and sense of urgency heard throughout the conference. Ms. Walters' remarks discussed the impact of climate change and focused on the importance of increased input from tribes and continued development of tribal traditional lifeways models at EPA. She said, "we need a national model for cultural sustainability. Risk assessment is the current way we make decisions for science and policy, but it's not enough. While EPA will keep that tool, we need to incorporate social and cultural perspectives for individual communities. We need a model for sustainability that addresses all of the relevant issues. We have looked at the environmental impacts, but we need to look at the economic and social impacts, too. We need to look not at just one year, but multi-year data."

Chief Ransom began his presentation by displaying a tribal Treaty Belt and explaining how it told the story of collaboration between Native American and non-Natives for hundreds of years. He pointed out that collaboration did not mean becoming the same, but rather, sharing strengths. "We have established Native environmental offices," he said, "and funding has been given by the government. But in the process of helping the Tribes, EPA has wanted us to follow their ways. This creates mini-EPA offices among the Tribes, but misses the opportunity for Tribes to bring their perspectives on the issues." He went on to explain that Native people have a science of their own, rooted in thousands of years living on the land. "As medicine people, we notice first the changes in the environment and feel the impacts first-hand. We know that the natural laws take precedence."

In his discussion of tribal approaches to environmental issues, Terry Williams, pointed out the need for tribes to consider cultural sustainability in the next 100 years. "In the last 100 years, there have been devastating changes to the land and the people. We must understand the past to help with the future," he said. He went on to discuss a Native view of the impact of climate change and other environmental crises.

"There is a fabric woven by the environment with all the species dependent on it. The trees, plants, and animals all live on the land and have life and are our brothers and sisters. There are relationships between each. They all interact with each other. Deer waste becomes nutrients for the trees, plants, and mushrooms. The trees drop fruit to help us sustain life. All the jobs are genetically imprinted in each species at birth...If there is too much degradation, it punches holes in the fabric of the environment."

Mary Arquette described her experience as a scientist and teacher applying traditional teachings in Akwesasne. In the Haudenosaunee Environmental Protection process she explained that the tribe's own research and knowledge of tribal ways has been used and integrated at every stage. Project coordinators examined traditional teachings, which produced three concepts for the model to relate the concept of human health to the natural world: wholeness, good relationships, and survival. However, she said, "an important limitation on the process and project work is in the area of finding funds to hire individuals to

help restore the traditional lifeways and teachings of the Tribe.” She continued, saying that “there are very few people left who have this knowledge to impart to the younger generation. It is also difficult to find people who know the language of the people and are also good at the scientific technical skills needed.”

The final panel presentation was offered by Preston Hardison on the Lifestream Principle, an indigenous concept that explains how all are tied together by mutual obligations in the river of life. He explained that, “Indigenous people want to get across this concept, at the international and national levels, that each of us has an obligation and responsibility as a result of the river’s flow – of animals, people, law, resources, and pollutants. Cooperation is necessary because every action affects every planetary inhabitant.” He also raises the important issue that tribes and federal agencies need to work toward better understanding of ownership and responsibility in regard to traditional knowledge.

Thursday night was the closing event of the conference. Roland Hemmet and David Nelson of TSC gave a summary of what had been accomplished during the conference, outlined priorities and goals for the future, and reiterated the TSC’s commitment to its mission. The full and ongoing participation of everyone in attendance at the conference was encouraged. The closing plenary was delivered by Dr. Cindi Barton, Director, USGS Water Resources Science Center, and focused on the importance of USGS/ Tribal partnerships. The presentation highlighted a number of significant success stories and offered concrete examples of how effective partnerships can lead to positive environmental outcomes.

Emerging Concerns, Next Steps, and Questions for the Future

A number of issues were raised consistently throughout the conference in many venues and from a variety of perspectives – some are listed below. This list is not exhaustive and no attempt has been made to rank the importance of items on the list; their relationship to many important conversations that occurred at this gathering can be discerned more fully by reviewing the detailed notes on presentations and question and answer sessions in the body of this report. These items suggest a range of concerns and questions that many felt deserve further study and dialogue.

- The potentially devastating impact of climate change on tribal traditional lifeways
- The importance of place – to remember that each place is different and therefore the people who live there are different, and the problems and solutions are unique for each place
- The special knowledge Native Americans have of changes in the environment because of their connection to their land
- The unique quality of indigenous knowledge and recognition of the value of Native science that has existed for generations
- The urgent need to find ways to protect and share tribal traditional knowledge for the benefit and healing of all
- The importance of recruiting, educating, and retaining Native scientists in and for Native communities
- The need for more data sharing, especially with those whose resources are severely limited
- The problem of diminishing funding which threatens existing programs as well as development of new ones
- The need to learn from effective Tribal/EPA collaborations and other collaborative efforts that have succeeded as creative tools for change and empowerment
- The need to assign responsibility to those who are responsible for environmental degradation as a step towards reparations and funding to begin or complete recovery and remediation

- The importance of remembering that Native Americans need to set their own agenda, not have it set by outside groups, EPA, or others, perhaps through a Native conference to focus on what that agenda should be
- The need for more and ongoing Native/ non-Native science dialogues, and
- The urgent need for action.

Evaluations from both participants and presenters overwhelming indicated that time devoted to all conference activities was time well-spent and most were enthusiastic about the prospect of attending future conferences of this type.

To learn more or to get involved in planning or participating in the next conference, contact a TSC representative at <http://www.epa.gov/osp/tribes/tribal/who.htm>.

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NATIONAL FORUM ON TRIBAL ENVIRONMENTAL SCIENCE CONFERENCE EVENT SUMMARIES

Sunday, September 24, 2006

Quinault Indian Nation Welcome

Facilitators:

Fawn Sharp, Guy Capoeman and
Bruce Jones, QIN Natural Resources Division Manager, Taholah, WA

Quinault Canoe Society

Drummers/Singers: Guy Capoeman, Carl Jackson, Tony Kramer, Richie Underwood, Eric Ellingson, Doug James, Anthony Duke Capoeman, Cecil Moses Capoeman, DeWayne Capoeman, Horton Capoeman, Jerome Obi, James Smith, Mikey Underwood, Dakota Capoeman, Donald Hawks

Dancers: Carly Martin (Miss Quinault), Aiyana Underwood (Princess), Talissa Clifton (Lil Princess), Melissa D. Capoeman(Underwood), Tahcoy Ibabao, Cleve Jackson, Arleen Kramer, Erika Kramer, Charli Sampson, Wakeena DeLaCruz, Ilia Capoeman

Queets Canoe Society

Drummers: Gene Sampson, Laura Obi-Sansom, Tony Boome, Jeffrey Kalama, Charles Sampson

Dancers: Sela Kalama, Silvanna Kalama, Carly Obi-Sansom, Kordell Obi, Shawna Obi, San-Dee Wells, Noelani Wells, Marjie Sanchez, Tashia Garcia, Sandra Wells-Kalama

Community members of all ages welcomed the conference attendees with a program of traditional song, drumming, and dance. Adult men drummed and sang while women, children, and young men sang and danced in traditional dress. The songs were performed with the permission of families to whom they belong and the entire program was overseen by tribal elders and chiefs of the Quinault Nation.

The Quinault Indian Nation (QIN) consists of the Quinault and Queets tribes and descendants of five other coastal tribes: Quileute, Hoh, Chehalis, Chinook, and Cowlitz. The QIN is a sovereign nation with the inherent right to govern itself and deal with other tribes and nations on a government-to-government basis. Bylaws established in 1922 and a constitution approved in 1975 form the foundations of the modern-day Quinault government.

The Quinault Indian Reservation, located on the southwestern corner of the Olympic Peninsula, is a land of forests, swift-flowing rivers, lakes, and 23 miles (37 kilometers) of undeveloped Pacific coastline. Its boundaries enclose over 208,150 acres (84,271 hectares) of some of the most productive conifer forest lands in the United States. Their ancestors were sustained by the land and by trade with neighboring tribes. Extensive salmon runs, abundant sea mammals, wildlife, and forests provided substantial material and spiritual wealth.

Today the people of the Quinault Indian Nation have made it a priority to remember and reclaim their rich heritage while undertaking a variety of modern enterprises. Tribal operations consist of: Administration, Natural Resources, Community Services, and Health and Social Services. In addition, the QIN boasts a number of successful enterprises, including Quinault Pride Seafood, Land and Timber, Quinault Beach

Resort, Maritime Resort, and the Mercantile, all of which promote growth and develop the potential of the Quinault Indian Nation.

Monday, September 25, 2006

FORMAL WELCOMING SESSION

Facilitators:

David Nelson, Tribal Science Council (TSC) Tribal Co-Chair, Director, Environmental Protection Department, Cheyenne Rive Sioux Tribe, Eagle Butte, SD
Roland Hemmett, TSC Agency Co-Chair, US EPA, Region 2, Edison, NJ

Roland Hemmett and David Nelson welcomed participants to the meeting and introduced the Quinault Honor Guard, which presented the colors (flags). Following the presentation of the colors, Dennis Martin of the Quinault Indian Nation gave the opening prayer.

Opening Prayer

Dennis Martin, Quinault Indian Nation, Taholah, WA

Welcome

Fawn Sharp, President, Quinault Indian Nation, Taholah, WA

President Sharp welcomed participants to Quinault Country and encouraged them to participate in the field trips so that they could experience the beauty of the land firsthand. Quinault Reservation beaches are closed to the public and protected. The Quinault appreciate scientists and the data they collect; sharing and collaboration is important for collecting useful environmental data. For example, in 2005 while the State of Washington was aggressively trying to develop water quality standards, local tribes encouraged the state to include fish presence data. The state did not include the data, and the tribes contacted EPA for assistance. The Washington water quality standards were not approved, and the state was told to include fish presence data. The new standards went into in effect on October 31, 2006. Conferences such as this are instrumental for networking, collaborating, and sharing ideas and information.

Welcome

Guy Capoeaman, Vice Chair, Quinault Indian Nation, Taholah, WA

Mr. Capoeaman welcomed participants and introduced Larry Workman, Manager of Centralized Communication for the Quinault Indian Nation.

Welcome

Larry Workman, Manager of Centralized Communication, Quinault Indian Nation, Taholah, WA

Mr. Workman gave a brief overview of Quinault Country. The reservation is on the southwest corner of the Olympic Peninsula, encompassing 330 square miles of land, including coastal areas, two valleys, second growth forest, swampy wetlands (approximately 2% of total land, which is in lake bed remnants of former glaciers), Lake Quinault, two large river systems, and several smaller river systems. The weather is influenced by the Olympic Mountains. Glaciers from 20,000 years ago created most of the land forms found on the reservation.

The Quinault people originated as land mammal hunters, but, as the climate changed and glaciers began to retreat, the Quinault became sea mammal hunters and fisherman. The Quinault were known as the Salmon People and were the southernmost whale hunting tribe along the West Coast. Because the cedar was considered the tree of life to the Quinault, they also were known as the Keepers of the Cedar. Cedar was important in everyday life and was used in clothing, housing, and canoe making.

More recently, Quinault land was divided into 88 allotments, and the fragmented ownership of the land is a challenge in managing the land and natural resources. Liquidation of most of the old growth forest in the 20th century also contributes to the challenge of natural resource management.

The Quinault of today are still primarily fisherman. They also have an intensive forestry program and an active tree-planting program. There is a variety of wildlife on the reservation, including threatened and endangered species. A new challenge is an invasive species (e.g., the European green crab). Plant species are also abundant on the reservation, and mushrooms, previously not utilized, have become an important resource to the Quinault.

There are several cultural stands of trees dedicated for totem poles and canoes. Young Quinault people travel on canoe trips to understand their ancestors and prepare for adulthood. Mr. Workman ended his speech with traditional words describing his people, "From the time of the first moon to the time of the last sun."

Conference Overview

Roland Hemmett and David Nelson

Dr. Hemmett introduced the TSC members. He explained that the TSC was established at the request of the National Tribal Caucus to provide a forum for tribes and EPA to work collaboratively to identify and address national environmental science issues important to tribes. He added the TSC is a tribally directed, joint effort with EPA that is supported by the Office of Research and Development (ORD). In April 2006 the TSC published a paper concerning tribal science issues. The TSC tribal representatives determined the conference theme would be developed around these tribal science priorities and emphasize promoting tribal relationships. The agenda was developed based on four tracks: Air, Water, Earth, and Community Health. Approximately 90 percent of meeting attendees are tribal, and while here, EPA would like attendees' input for developing a tribal training program.

Mr. Nelson described the need to integrate tribal tradition, teaching, and culture with scientific data and statistics. Originally, tribes did not want EPA input on how to keep tribal land and water clean, and EPA did not understand the tribal traditions and cultures, but the two groups are learning that it is necessary to integrate each other's knowledge and that traditions and science must come together. He introduced the EPA members of the TSC and thanked them for their help in planning this meeting.

KEYNOTE ADDRESS

Oren Lyons, Onondaga Nation Council of Chiefs of the Six Nations of the Iroquois Confederacy and State University of New York, University at Buffalo, Department of American Studies, Buffalo, NY

Tony David, St. Regis Mohawk Tribe, introduced Oren Lyons, Faithkeeper of the Turtle Clan of the Onondaga Nations. Chief Lyons helped establish the United Nations (UN) Working Group on Indigenous Populations and is a member of the UN Human Rights Division. A full professor at the State

University of New York at Buffalo, he recently was named the State University of New York Distinguished Service Professor. In addition to receiving the Ellis Island Congressional Medal of Honor, he helped to diplomatically resolve the 1990 Oka Crisis, a violent land dispute in Quebec, Canada, involving the Mohawk Nation.

Chief Lyons began his talk with a traditional greeting in the Onondaga language and thanked the TSC for the invitation to speak. He mentioned that he had attended the TSC Risk Assessment/Health and Well-being Workshop in Albuquerque, New Mexico, in 2003.

A synopsis of his remarks follows.

People ask me many questions during my travels. They want to know, what is the Indian philosophy? How has Indian leadership prevailed and where did it come from? We took instruction from the Earth and the natural world. There are differences between Indian culture and Western culture. Indians value cooperation above competition. Relationships are valued above profit. Family and community are valued above accruing wealth.

People ask me, where are we today and what is in store? They are worried about the state of Earth. Although there are many reports which say that progress is being made in how environmental problems are dealt with, there will be no real progress as long as we value profit over life. Meetings will be taking place here, at this conference; constituencies, issues, and positions will be clarified. It is time to take action. You have to make what has been discussed at these meetings operational.

The Iroquois have many names, including the native Haudenosaunee (People of the Long House), and still have a traditional council of chiefs. Our history is one of strength and resilience. Roughly 16 million Indians were living in North America at the time of Columbus' landfall, but that number dropped to 250,000 by the beginning of the 20th Century. Today, roughly 2.5 million people in the United States identify themselves as Indian. It took 450 million years to reach a world population of 2.5 billion; it took 55 years to reach the second 2.5 billion. Doubling a population of this size over 55 years is not sustainable! During the worldwide hunt for sustainable resources, Indians must keep their land and not trade it. Humans must learn to share and work together to determine sustainable resources, regardless of color or nationality.

The Great Peacemaker came among the Indians more than 1,000 years ago and brought peace to six warring Indian Nations: Onondaga, Mohawk, Seneca, Cayuga, Oneida, and Tuscarora. They gathered at the shore of Onondaga Lake (currently the only Superfund lake in the United States, with 400 tons of mercury), and the Peacemaker gave the tribes principles to live by and defined democratic structure. Because the earth is female, women are in charge of earth and water; men are in charge of fire. Although women are in charge, there must be a consensus, because locked leadership cannot help the people.

The first principal to live by is peace. It is not possible to have peace without health, but 50 million people in the United States do not have health care. The second principle is of equity and justice; one cannot have justice without equity. The third principle is the power of the good mind, which encompasses reason.

The Great Peacemaker then planted a great white pine, with four roots of truth growing in the four directions of the earth. If one is lost, the roots can be followed back to their source to find the Great Peace. The Great Peacemaker's laws must not be challenged, but nations today are challenging these laws and one of the results is global warming. Although people are insignificant in terms of the earth, they have been able to cause systemic change.

The Great Peacemaker instructed the leaders to make all decisions with the seventh generation in mind, so that this generation too will have a sustainable life. The responsibility of all life is in the leaders' hands. Leaders must understand the problems before they can find a solution. The problem must be examined and explored. Corporations have usurped traditional leadership, and business has usurped government. Profit is the driving force of today, and corporations, which are independent entities, have allegiance only to themselves. The corporate leaders must accept the leadership of all life and must learn to understand the earth. Mother Nature has only unchallengeable laws, and corporate leaders must adhere to these laws.

It is time for action, and each individual must be a leader and think for himself. Although it is common for humans to be afraid, we must move beyond the fear. Strength comes from being united, so we must also be united in our efforts. This is illustrated by Einstein's observation that the strongest law of the universe was that of "compound" which starts slow, gains speed, and then explodes. Humans are in the acceleration phase right now, and the two perfect storms of global warming and increasing human population will soon explode.

Any profit taken is at the expense of future generations, and leaders must stop this acceleration. Chief executive officers point the fingers at stockholders for demanding profits, so the stockholders must then be responsible and think of the future. Although earth's resources are finite, humans are not acting as if they are finite. To cool itself from global warming, the earth's atmosphere will begin to snow continuously for more than 100 years. The snow will compress into ice, which will form glaciers. Another ice age will occur.

Fortunately, cooperation is coming about. EPA and tribes are working together and planning, trying to stop catastrophic environmental events. By the end of this meeting, there must be a plan of action in place; information that has been gathered must be acted on. There is no compromise with the laws of nature, so the plan must get humans back in line with these laws. The plan must be equitable, fair, and consider the entire earth, not just the United States. It is the job of scientists and leaders to determine how to address global changes. Courage of conviction is necessary, and racism must not get in the way. Action must be taken now, because changes are going to occur at a surprising rate. Our duty is to do what we can. Find unity of mind. Act on it.

OPENING PLENARY – American Indians/ Alaska Natives and Global Climate Change

Alaska and Global Climate Change

Lydia Olympic, Igiugig Tribal Village Council, Igiugig, AK

Lydia Olympic illustrated Chief Lyon's point about being ready to accept information from unusual places by relating an anecdote about an event that happened in her village, which has a population of 47 people. One February, a little girl in the village found it very amusing that the squirrels were awake when they should be sleeping. The girl's excitement led Ms. Olympic to pay more attention to the changes that were occurring in her village and she asked the elders if they had any stories about global warming. They did not; nor is there an Igiugig word for global warming.

She then described the following changes and issues that are emerging in Alaska.

A lot of change is going on in Alaska. Squirrels are coming out of hibernation in February; bears are coming out of hibernation in March when there is nothing for them to eat. Migratory birds are arriving early, in April, and dying in sudden freezes. Brown bears are moving into northern territories where they have never been. The spruce bark beetle is infesting and killing more trees because of the higher temperatures in the region. Cannibalism among polar bears is being recorded for the first time.

Coastal waters are now so warm that there are tuna, sharks, and tropical fish present for the first time. And ice is thinner all year long. Thinner ice means earlier ice breakup, which in turn causes injuries and deaths among subsistence seal-hunters. Coastline erosion and the rise in sea level are resulting in floods. Some villages are actually moving locations in order to avoid being destroyed by flooding during coastal storms. There are an increased number of mosquitoes and sand flies. Additionally, large numbers of salmon have died in lakes before spawning. Is it climate change?

Alaska Native people are still intimately connected to the land. We know that something is wrong. The environment is not healthy, and it is a matter of life and death for us and for the animals. The stories of Alaska Native people need to be told, and they need to be heard. If the world is ready to listen to indigenous people -- who know and understand the rhythm of the earth -- and act on this knowledge, then the earth's balance can return.

PANEL DISCUSSION -- American Indians/ Alaska Natives Climate Warming Working Group: A Red Paper

Daniel R. Wildcat, Haskell Indian Nations University, Haskell Environmental Research Center, Lawrence, KS

Margaret Hiza-Redsteer, USGS, Earth Surface Processes, Flagstaff, AZ

Roberto Gonzalez-Plaza, Lummi Nation, Northwest Indian College, Bellingham, WA

Daniel Wildcat explained that this paper began as the result of the *Impact of Climate Change on Indigenous Peoples Symposium* held at the Haskell Indian Nations University in June of 2006. The symposium was part of a National Science Foundation (NSF)-funded effort, the Center for the Remote Sensing of Ice Sheets. Additional volunteers to commit to this project are being sought.

He stated that scientific evidence is clear that we are experiencing global warming – heating, even burning. If there is anyone who thinks that global warming is an abstraction, talk to Alaska Natives. It is threatening their lifeways, challenging what it means to be indigenous. Although global warming is especially apparent in Alaska, if we pay attention, changes can be seen everywhere. It is necessary to collect accurate data so that tribal leaders can make informed decisions regarding the future. This conference is the place to make key relationships and to make things happen.

Dr. Wildcat introduced two collaborators of the project, who gave their personal perspectives on the subject of climate change.

Margaret Hiza-Redsteer, a resident of the Navajo Nation as well as a member of the U.S. Geological Survey, stated that there is a difference between a Native American scientist and a scientist who happens to be Native American. Scientists are needed to investigate the changes in rainfall, rain-to-snow ratio, and so forth. Many Native American scientists have learned science from dominant-society institutions and have lost touch with their native and traditional ways, so funding is being secured to bring these scientists back to reservations.

All around the Navajo Reservation National Weather Stations are recording information. But, the National Weather Service (NWS) data are inaccurate for the Navajo Nation. The NWS stations are outside of the nation and predict data inside the nation's borders via computer modeling. The computer predictions show more rainfall than actually occurs. Borders of the Navajo Nation were drawn so that Navajo people are living in the driest, most extreme areas. To rectify this and get more accurate readings for Navajo, the nation is attempting to set up a weather station within its borders and bring Native American geoscientists in to interpret the data.

Native American traditional observations are science; therefore, science is not a new concept to Native American nations. Sixty percent of the world's food crop and 80 percent of the world's medicines are the products of Native American science. Native American culture is based on observation. So is science. We need to pay attention to the signs all around us.

Roberto Gonzalez-Plaza stated that global warming is human driven, and the changes as a result of this phenomenon are happening fast; humankind has become a geophysical force. A personal change in behavior is required to stop what is happening on earth; nothing will change without a change to human actions. The climate workgroup, formed to take action on "global burning," welcomes anyone who would like to become a member.

It is necessary to be aware always of changes, even when they are imperceptible. The changes in Alaska and the southwestern United States are obvious. The changes in the Pacific Northwest are not as obvious, but they are present. The changes must be analyzed using a systemic approach (i.e., every change means something and affects the system as a whole). Inequity is rampant throughout the world, and the scientific advances made in the name of health and well-being are an illusion. We must respond to Chief Lyon's call to action immediately.

Dr. Wildcat explained that geoscience must be made relevant to the big picture and that American Indian and Alaska Native geoscientists with indigenous ideas are needed. Nature to Indians is not an abstraction, and Indian scientists can bring this aspect to western science and technology. It must be noted that each culture and tribe emerges out of a specific landscape and, therefore, tribes are different from each other. Each culture has learned how to exist within each of these landscapes. Humankind needs this indigenous realism, and stereotypical assessments of traditional environmental knowledge cannot be accepted. Traditional environmental knowledge is not romantic or unrealistic and does not mean going back to the past. Teaching traditional environmental knowledge, as opposed to science out of books, is more relevant and more desirable to learn.

Solving the problem of climate heating impacts will require indigenous ingenuity. This "indigenuity" will in turn need the empowerment of Native natural intelligence, imagination, inventiveness, agile leadership, and honesty. Indigenuity plays to the strengths of the Indian people and is emergent from the nature-culture nexus. It is experience-centered, experiment-rich, and informed by attentiveness to the unique biomes and environments of the earth.

Volunteers, especially tribal college partners, are needed to work around existing agency, tribal government, and university boundaries. The Working Group project includes a long-term NSF proposal to assemble a partnership-coordinated geoscience and diversity program between tribal colleges in which undergraduate scientists will perform geoscience research and gain experience while collecting data on tribal ground that tribes need, especially as the budget of the Bureau of Land Management is \$60 million short of the level needed to survey tribal properties. American Indian geoscience literacy is necessary to ensure that indigenous tribal knowledge of landscapes and climates are valued, used, and incorporated into tribal geoscience education and research.

Wealth is found in relations. A collaborative effort between federal agencies, tribes, and tribal colleges must be formed to ensure that geoscience education and research opportunities for American Indians and Alaska Natives are integrated and coordinated. When looking at the natural world, Western scientists and planners see resources; American Indians see relations. If society began to view the natural world in this indigenous way, many changes for the better would occur.

Lifeway protection activities can be advanced by using the latest information technologies (e.g., podcasting, web technology, etc.) to create a web-based clearinghouse for accurate information and knowledge about the impact of global warming on indigenous lifeways. Such a clearinghouse will benefit many communities, tribes, and individuals.

Discussion

Comment -- Preston Hardison, Tulalip Tribes, described a clearinghouse project on climate change already underway at <http://climate.nativecommons.net>. A database system is being developed, and the project leaders are looking for collaboration regarding data exchange models. Currently, there are more than one million records about both science and traditional environmental knowledge, including links to scientific and tribal literature that discuss environmental change and impacts. Such an effort requires collaboration; information must be shared to survive because this is a crisis situation.

Comment -- A participant expressed frustration with the lack of communication between tribes. EPA is to be commended because it has good communication with tribes. A system for communication must be established.

Comment -- Christine Chaisson, The LifeLine Group, described the George Washington University Graduate School for Political Management's Semester in Washington Program, which allows students to study in Washington and learn how the federal government works, including elections, diplomacy, lobbying, and issues management. There are 11 guaranteed spots for Native American students.

Field Trips to the Coast and Rainforest Quinalt Nation Ambassadors:

Phillip Martin Sr., Butch Pope, Phillip Martin Jr., Karl Braden, Bruce Wagner, Justine James, Anna Towkajhea, and Patricia Ward Sheridan

Guided bus tours were provided by the Quinalt Indian Nation. Both tours began with a drive along the Pacific Ocean and included a history of places and people along the way. Tour guides were assisted in their talks by the use of a guidebook compiled by Justine E. James, Jr., Cultural Resource Specialist, Quinalt Indian Nation, Taholah, WA. A brochure describing the trips, prepared by the QIN Centralized Communications Division, Taholah, WA, was also provided.

Coastal Tour

The coastal tour included a stop in the town of Taholah where the tour group visited the Quinalt Museum and the Quinalt Pride Seafood plant. After these stops the tour continued along the Pacific Ocean route to the beach at Point Grenville. Here the group was shown techniques for razor clam sampling by fisheries biologists and given a presentation providing a general overview of the impacts of algal blooms on the clam populations and harvests.

Rainforest Tour

The rainforest tour included a stop at Lake Quinalt at the eastern tip of the Quinalt Indian Reservation. The group toured the fish hatcheries and learned about the workings of the hatcheries from the hatchery crew. A lake-side presentation described local efforts to eradicate the invasive plant knockweed from the area. The tour continued with a drive further into the Olympics. Here the group took a guided walk along the US Forest Service Rainforest Trail in the Olympic Rainforest.

Evening Event

Reception sponsored by Fond du Lac Reservation

Poster Session

The Poster Session was an informal session held in the evening after conference attendees had returned from tours to the coast and rainforest. Posters were displayed throughout the hall and presenters were available to answer questions and discuss their topics with those in attendance. Brief descriptions of posters are included below. One of the goals of this session was to give students and young professionals an opportunity to present their work.

Poster Abstract

Putting the Community behind the Wheel: Community-Driven Research and Intervention in Kwakoe Gron, Suriname

Sarah Augustine, Suriname Indigenous Health Fund, University of Washington, Seattle, WA
Daniel Peplow, Suriname Indigenous Health Fund, University of Washington, Seattle, WA

The Indigenous Amerindian and Tribal Maroon people living in Suriname are facing a potentially catastrophic environmental and public health crisis due to environmental degradation from gold mining, including mercury (Hg) contamination. Between 30 and 60 metric tons of Hg are released into the environment each year by gold miners in the region. Risk-assessment studies show that food-chain contamination and bioaccumulation are occurring at levels known to cause nervous system damage in people. The effects of Hg are viewed by environmental and public health officials as scientific problems and, it is assumed that objectively knowable facts, derived gradually and progressively through the use of the scientific method, will lead to rational solutions. Meanwhile, tribal people who are most effected by Hg pollution are increasingly resisting studies that do not address their own research needs and priorities.

This study revolves around the assumption that scientific experiments and observations reflect the cultural context in which they are performed. In 2005, a community-driven risk assessment study was conducted in partnership with the village of Kwakoe Gron. Community members revealed that they are concerned with a variety of health risks associated with mining, including river sedimentation, poor sanitation caused by the influx of approximately 10,000 transient miners, and cyanide released by large mines as well as Hg released by transient miners. The cooperative approach yielded: (1) a three-point action plan to address Hg contamination; and (2) an ongoing water quality project, both of which integrated relevant technical, social, and cultural factors.

Poster Abstract

Source Water Protection Planning in a Shallow Alluvial Aquifer

Dale Becker, Evergreen Rural Water of Washington, Shelton, WA
Samuel Iwenofu, Quinault Indian Nation, Taholah, WA

The Quinault Indian Nation completed a Source Water Protection Plan with the assistance of Evergreen Rural Water of Washington. The planning process included delineation of source water protection areas through step-wise time of travel modeling, potential contaminant source inventory, contaminant risk assessment, and management through public education and development of Best Management Practices (BMPs) for forestry. The step-wise approach to delineating source water protection zones was used to provide a time of travel capture zone that allows for adequate protection of water sources with limited resources. First, the time of travel zones was delineated using a circular Calculated Fixed Radius, which assumes no recharge and no aquifer gradient. One, 5, and 10-year time of travel zones were then delineated using WhAEM 2000, an EPA steady state, heterogeneous analytical element groundwater

model. WhAEM 2000 results were evaluated based on comparison of static conditions to those measured in previous aquifer assessments and sensitivity analysis. Based on cost estimates for numerical modeling and the assessment of the WhAEM 2000 model errors, it was determined that no further modeling was warranted until a risk assessment was completed for the aquifer. If the Source Water Assessment concluded that there was a high risk of contamination, then further modeling would be assessed. Because no high risk potential contaminant sources were present, no further modeling was deemed necessary. The management plan includes public education, new forestry BMPs, and emergency planning.

Poster Abstract

The Decline of Salmon Species—The Ecological and Urban Changes in the Nooksack Watershed

Carmen Bland, Lummi Cedar Project, Bellingham, WA

The Lummi people of Pacific Northwest Washington have throughout their existence relied on the abundance of salmon in the Nooksack River. Due to both ecological and urban changes in the Northwest, salmon are disappearing; we are working to protect what is left of this resource. This project implements a Global Earth Observing System of Systems (GEOSS) approach to investigate changes in the watershed that may be related to fishery decline and explores the use of 30 years of Landsat satellite imagery to track urbanization and land cover change. It also utilizes data from the National Aeronautics and Space Administration's (NASA) Terrestrial Observation and Prediction System (TOPS) to investigate relationships between daily water flow, temperature, and water quality data for the Nooksack Watershed. The NASA Applied Sciences program includes Water Management as one of its 12 areas of national priority, and future work will extend this preliminary analysis to incorporate additional satellite data measurements on parameters such as sea surface temperature. The primary goal of this project is to develop the data and analysis techniques to develop a decision support tool for management of the Nooksack watershed that integrates NASA data with ground-based observation systems.

Poster Abstract

Reducing Health Risks to the Anishinaabe from Methylmercury

Adam De Weese, Great Lakes Indian Fish and Wildlife Commission, Biological Services Division, Odanah, WI

Since 1989, the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) has collected data on mercury concentrations in walleye from lakes in the 1837 and 1842 treaty-ceded lands of northern Wisconsin, Michigan, and Minnesota. Beginning in 1996, GLIFWC used these data to produce color-coded, GIS-based consumption advisory maps providing lake-specific information on the amount of methylmercury in walleye. GLIFWC received an EPA Science To Achieve Results (STAR) grant in 2003 to enhance and evaluate its efforts to reduce risks associated with subsistence-based consumption of methylmercury contaminated fish. As part of the grant, GLIFWC's maps were revised to ensure that they were culturally sensitive and that they adequately protected the health of tribal members. Tribal leaders, health care providers, fish harvesters, elders, and youth were trained in the use of the maps. Tribal health care providers were asked to train mothers with young children and women of childbearing age through tribal health programs. The efficacy of these interventions is being evaluated through a series of targeted surveys designed to document changes in knowledge and behavior after implementation of the program.

Poster Abstract

Mni Wiconi Rural Waters that Supply Water to One-Sixth of South Dakota Including Three Indian Reservations

Syed Y. Huq, Director, Mni Wiconi-Rosebud Rural Water System, Rosebud, SD

“Mni Wiconi” is a Lakota term meaning “water is life.” The purpose of this project is to provide adequate water to meet the economic, environmental, municipal, and public health needs in an area where existing water sources are highly mineralized and of poor quality. Also higher than average numbers of water-borne diseases are found in the design area. In some communities, water must be hauled from distant places. Mni Wiconi was authorized by Congress in 1988. This is the largest Rural Water Project in the Country. The area of study comprises 12 counties, one-sixth of South Dakota, and more than 12,500 square miles, including the Rosebud, Oglala, and Lower Brule Sioux Reservations.

- Design population is 51,635.
- Water source: Missouri River and Ogallala Aquifer.
- Authorized funding: \$440 million.
- Authorized date of completion: 2008.
- Design Flow: 13,886 GPM.
- Will also serve 274,811 head of livestock.

The completed project includes intake, treatment plant, pipelines, pumping stations, reservoir, SCADA, wells, and electrical transmission. Seventy-two percent of the project has been completed at a cost of \$300 million. Mni Wiconi generated more than 250 construction-related and 125 operation and maintenance-related jobs. This project represents reconciliation at its best between Indians and Non-Indians. The project is expected to be extended through 2012 at a total cost of more than \$500 million.

Poster Abstract

Asthma Awareness Poster Boards from Bois Forte Environmental Services

Kevin Koski, Bois Forte Tribal Government, Department of Environmental Services, Nett Lake, MN

Bois Forte Environmental Services displayed its four-tiered Asthma Awareness presentation board. EPA has requested more involvement in asthma awareness activities, and this is a display that has been brought to various wellness fairs, teen conferences, and asthma awareness functions for school children in the past year. The boards include visual depictions of the major asthma triggers, depictions of the physiological effects of asthma, copies of some of the better handouts available on asthma prevention, and a plethora of tips for asthma trigger prevention in the household.

Poster Abstract

Self-Regulating Tidegates and Estuary Restoration: The Fornsby Creek Restoration Project on the Swinomish Reservation

Todd Mitchell, Swinomish Indian Tribal Community, Laconner, WA

Karen Mitchell, Swinomish Indian Tribal Community, Laconner, WA

Rachel LovellFord, Swinomish Indian Tribal Community, Laconner, WA

Sarah Akin, Swinomish Indian Tribal Community, Laconner, WA

The Fornsby Creek Self-Regulating Tidegate (SRT) project is a fish passage and habitat restoration project located along the Swinomish Channel of the Skagit River delta in Washington State. This project seeks to strike a balance between current and future land use by promoting hydraulic connectivity and exchange coupled with active restoration plantings to stimulate riparian recovery. This project will reopen the Smokehouse Floodplain to fish use by replacing existing impassible tidegates with self-regulating tidegates (SRTs). The increased tidal influence will recreate estuary-type freshwater/salt water mixing zones, critical rearing habitat for juvenile salmonids. In total, the project will reopen more than 5 miles of channel to fish and more than 70 acres of Tribal trust land will be planted in buffer vegetation. Extensive

water quality monitoring (pre- and post-project) will determine the effect, if any, of the increased saltwater on adjacent farmland.

Poster Abstract

Introducing...US EPA's Office of Emergency Management, How Can We Serve You?

William Nichols, Regulatory and Policy Development Division, Office of Emergency Management (OEM), Washington, DC

This poster explains OEM's relationship with Tribes and what services, training, and information OEM can provide to the tribes. The new Office of Emergency Management (OEM) consolidates the Office of Solid Waste and Emergency Response's prevention, preparedness, and response duties by joining the Oil Program Center, Emergency Response and Removal Program, and the Chemical Emergency Preparedness and Prevention Office. Our mission is to ensure that this Nation is better prepared for environmental emergencies.

OEM works with other EPA partners, Federal agencies, states, Tribes, local response agencies, and industry to prevent accidents as well as maintain superior response capabilities. This is facilitated through partnerships, joint strategy development, technology development and deployment, training, and exercises. A major focus of our tribal services is to assist Tribes with oil spill prevention and preparedness issues as they relate to the production and storage of oil. EPA can provide the following:

- Inspectors for regulated oil storage facilities in Indian Country
- Compliance assistance information for owners/operators and Tribal environmental staff
- Oil spill prevention/response training, and
- Chemical hazard assessment, preparedness, and response training.

Poster Abstract

Groundwater and Heat Transport in the Hoh River Watershed: A Pilot Study on the Impact of Forest Practices on Ground and Surface Water Interactions

Jill Silver, 110,000 Years Institute, Port Townsend, WA

Patricia Olson, Pacific Watershed Institute, Seattle, WA

Forested wetlands draining to streams in the Hoh River basin are the subject of this five-year investigation on the mechanisms and processes of groundwater heat transport to streams. Although forested wetlands contribute surface and subsurface flow to streams, these forests are harvestable under the State Forest Practices Act. Riparian shade on streams has been well studied and is recognized as an important component of a healthy thermal regime. Groundwater shading has received much less attention, especially in this region. A recent adaptive management research topic related to forest practices in Washington State focuses on groundwater influence on stream temperatures.

The primary objectives of this study are to determine if a relationship exists between management practices and groundwater temperature; and if there is a corollary relationship between groundwater temperature and stream temperature. The data will additionally contribute to the evaluation of groundwater relationship to stream base and storm flows.

The primary research question examines whether tree canopy removal changes groundwater temperatures. Supporting questions considered include: (1) attenuation of groundwater temperature with distance from surface water; (2) attenuation of groundwater temperature with depth from the surface, and at what depth; and (3) contribution of groundwater to surface water, and the relative contribution and role (e.g., inflow to holding pools, inflow to spawning habitat).

Using Forward Looking Infrared technology (FLIR), aerial photographs, wetlands inventory, soil maps and field reconnaissance, we identified areas of groundwater recharge and areas of discharge to streams in the Hoh watershed. Three study sites were chosen from this sample set—two from managed forestlands, including a recent clear cut harvest unit as the harvested site, a mature second growth stand as the control, and an unmanaged old growth forest site as the reference site. The three sites have similar soil characteristics, elevation, topography, slope, and aspect.

Instrumentation was installed in 2001, establishing ground and surface water networks to continuously monitor water levels and temperatures in the stream, soil, groundwater and air of each site. Each site included a stream, forested wetland, and upland areas. Each stream and 8 to 10 wells per plot were instrumented with continuous recording pressure transducers. Other continuously measured parameters include soil matric potential, soil moisture, humidity, precipitation, and solar radiation.

Poster Abstract

Effect of Body Size and Lipid Content on Contaminant Concentration in White Sturgeon, *Acipenser transmontanus*

Christopher W. Thompson, Environment International, Ltd., Seattle, WA

Valerie A. Lee, Department of Research, Environment International, Ltd., Seattle, WA

White sturgeon, *Acipenser transmontanus*, populations have declined dramatically throughout much of their range in the Pacific Northwest and are of great concern to many constituencies, including state, federal, and tribal agencies in the United States and Canada. Both inorganic and organic pollutants are suspected of contributing significantly to these population declines but little work has been done to date to evaluate this. In many taxa, including fish, many contaminants continue to accumulate in individuals throughout their lives such that, on average, the oldest individuals have the highest concentrations of contaminants.

The Columbia River InterTribal Fish Commission (CRITFC) and the U.S. Environmental Protection Agency collected whole-body and fillet tissue samples from sturgeon in the Columbia River basin in 1996 through 1998. We conducted new analyses of these data, which indicate that concentrations of many inorganic (e.g., chromium, mercury) and organic contaminants (e.g., DDTs, PCBs, phenols, chlordane, 2-chloronaphthalene) increase with sturgeon body size (mass and length) in fillet samples. These results were not obtained with whole body samples, but this may reflect lack of statistical power as similar trends exist in both whole-body and fillet data. Also, if tissue concentration data are lipid-normalized, no significant relationships are found between contaminant concentration in fillets and sturgeon body size. This indicates that the positive relationship between contaminant concentrations in fillet samples and sturgeon body size reflects an increase in lipid concentration with increasing body size in sturgeon, a common phenomenon in fish.

Many conclusions and implications can be drawn from these results:

- Larger (older) sturgeon are potentially at greater risk of harm from contaminants than are smaller (younger) sturgeon.
- Sturgeon may effectively sequester contaminants in muscle rather than in other tissues such as the liver, where contaminants may have more deleterious effects.
- Concentrations of contaminants in individual tissues, such as muscle and liver, may be much more useful for assessing risk than are whole-body samples.
- Assessment of the ecological risk to sturgeon from contaminants, as is being done at Superfund sites in Portland Harbor and the Upper Columbia River, must include consideration of adults.

- It is not appropriate to use other fish species as “surrogates” to assess risk of pollutants to sturgeon.
- Additional work must be done to develop a non-lethal and minimally invasive method for monitoring contaminant burden in, and assessing risk to, adult sturgeon.

For contaminants that are deposited to a significant degree in muscle tissue, we strongly advocate additional work on prebreeding (juvenile and subadult) sturgeon to evaluate the relationships between contaminant concentrations in muscle with (1) other individual tissues (e.g., liver, gills), and (2) whole-body samples from the same individual sturgeon. These results could be used to develop a contaminant monitoring program for adult sturgeon.

Poster Abstract

Environmental Contaminants in Traditional Foods of the Yupik People on St. Lawrence Island, Alaska

Vi Waghiyi, Alaska Community Action on Toxics, Anchorage, AK

Pamela Miller, Alaska Community Action on Toxics, Anchorage, AK

This poster provided results of research and advocacy work on St. Lawrence Island, Alaska. St. Lawrence Island is located in the Bering Sea in Northwestern Alaska, 40 miles from the coast of Siberia. All of the people of St. Lawrence Island are Yupik (Eskimos) who live in two tribal villages whose livelihoods depend on the traditional foods that they hunt, fish, and gather.

One of the research teams for Alaska Community Action on Toxics (ACAT) has shown that the Yupik people of St. Lawrence Island have high blood serum levels of polychlorinated biphenyls (PCBs) and pesticides. The ACAT team for St. Lawrence Island is comprised of (1) scientists from State University of New York, Albany; (2) environmental health researchers and advocates from ACAT in Anchorage; (3) environmental health officers of the Norton Sound Health Corporation in Nome—the entity that provides medical care for St. Lawrence Island; and (4) five St. Lawrence Island Yupik researchers, all of whom were trained in field and health research techniques—four residents of St. Lawrence Island and one currently living in Anchorage who coordinates all of the work of ACAT at the Island.

In 2000, ACAT was awarded a grant from the National Institute of Environmental Health Sciences, which supported the work of the ACAT research team for the first 4 years at St. Lawrence Island. The study was titled: Environmental Health & Justice for St. Lawrence Island. This was a community-based participatory research project in which the communities of Gambell and Savoonga on the Island conducted environmental and health research. The study addressed impacts from the two formerly used defense sites on the Island and the long-range transport of contaminants by oceanic and atmospheric currents from more southerly latitudes to St. Lawrence Island.

With a grant from the U.S. Environmental Protection Agency (EPA) provided in 2003, the ACAT research team has been examining traditional foods of the Yupik people on St. Lawrence Island for PCBs, three pesticides, and several metals. We obtained multiple samples of traditional foods (seal, whale, walrus, fish, seal oil, greens, sea bird eggs, berries), including various parts of animals, for congener-specific measurement of PCBs and levels of pesticides and metals. The ACAT research team is determining the most significant sources of exposure, and how methods of preparation for consumption influenced the level of contaminants. This information is critical to the community to help people make informed decisions about food choices to reduce exposure to environmental contaminants.

Poster Abstract

Analysis of Polycyclic Aromatic Hydrocarbons in Marine Mammals From the North Slope of Alaska

Dana L. Wetzel, Mote Marine Laboratory, Aquatic Toxicology Program, Sarasota, FL

John E. Reynolds, Mote Marine Laboratory, Manatee Research Program, Sarasota, FL

Phil Mercurio, Mote Marine Laboratory, Sarasota, FL

Cyd Hanns, North Slope Borough, Department of Wildlife Management, Barrow, AK

North Slope subsistence communities are concerned about contaminant levels in the environment and the foods they consume. In this area, one contaminant type about which subsistence users are concerned is the polycyclic aromatic hydrocarbons (PAHs) associated with oil and gas production and pollution (or spills). Our studies involve two distinct projects: marine mammals and freshwater systems. We have worked closely with Native hunters and scientists with the North Slope Borough Department of Wildlife Management to acquire samples. Ten matrices were analyzed from each of several bowhead whales and pinnipeds (seals) taken for subsistence use. For the marine mammal matrices analyzed to date for PAHs, we have found no detectable levels of oil-related contaminants.

Although PAHs are not currently detected in matrices of the bowhead whales or bearded seals, biomarker assays suggest that some animals have been exposed to oil. Analyses also are underway to examine possible effects of storage and handling on PAH levels of whale meat. Sediments and fish from two of the largest freshwater systems on the North Slope, Teshekpuk Lake and the Colville River, are being assessed for PAH concentrations as well. The sorts of baselines we are creating are especially important to concerned subsistence communities who are trying to make informed decisions about their diets. The baselines also are vital to assess future changes associated with oil and gas development in coastal regions or offshore of Alaska's North Slope. When our analyses are complete, we will work with local educators and leaders to communicate our results to the involved communities, as well as to scientists and decision makers.

Tuesday, September 26, 2006

8 A.M., AIR POLLUTION TRANSPORT

Facilitators:

Christine Berini and David LaRoche

Identifying Transport Pathways Using the HYSPLIT Model

Glenn Gehring, Office of Air Quality, Department of Science and Engineering, Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR

This presentation explored the use of the National Oceanic and Atmospheric Administration's (NOAA's) HYSPLIT model to identify transport patterns for air pollutants.

<http://www.arl.noaa.gov/ready/hysplit4.html>

The HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) model is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. The model can be run interactively on the Web through the READY system on our site or the code executable and meteorological data can be downloaded to a Windows PC. The following computations can be executed using this system:

Trajectories

- Single or multiple (space or time) simultaneous trajectories
- Optional grid of initial starting locations
- Computations forward or backward in time
- Default vertical motion using omega field
- Other motion options: isentropic, isosigma, isobaric, isopycnic
- Trajectory ensemble option using meteorological variations
- Output of meteorological variables along a trajectory

Air Concentrations

- 3D particle dispersion or splitting puffs (top-hat or Gaussian)
- Instantaneous or continuous emissions, point or area sources
- Multiple resolution concentration output grids
- Fixed concentration grid or dynamic sampling
- Wet and dry deposition, radioactive decay, and resuspension
- Emission of multiple simultaneous pollutant species
- Automated source-receptor matrix computation
- Ensemble dispersion with concentration probability output
- Integrated dust-storm emission algorithm
- Define rate constants to convert one species to another

Meteorology

- Model can run with multiple nested input data grids
- Links to ARL and NCEP meteorological data server
- GUI integrated GRIB decoding for NAM, GFS, and ECMWF data
- Access to forecasts and archives including NCAR/NCEP reanalysis
- Additional software to convert MM5, RAMS, COAMPS, and other data
- Utility programs to display and manipulate meteorological data

One use for this model is to identify sources (mostly large power plants) that may have contributed to high ozone concentrations by tracking the path the parcel of air took before the high concentration was observed (backward trajectory). Mr. Gehring presented several examples but first reviewed ozone precursors.

NO_x and VOC are ozone precursors that need sunlight to convert. Power plants emit considerable NO_x, but their emissions are typically low in VOC – they are VOC limited. NO_x rich but limited VOC's is called NO_x limited. However, forests can emit considerable VOC, so location matters. A power plant that gets NO_x credits with air going over a forest can make ozone worse. In a NO_x rich environment you need to look at all potential sources of VOC. Somewhere downwind from pollution sources you will find ozone.

If one were to consider two different sites and find unexpectedly high readings at one of them one might discover that in the region there are a number of power plants. To understand why, one needs to know where the air came from. A curve in the wind pattern may have brought it up from down below. If this situation is examined more closely, one might find two suspected sources for high readings. Using HYSPLIT software to do dispersion shows where in the region emissions were coming from during the time of high readings. The software shows the dispersion; air passes over power plants then hits the monitoring site. One can look at a 48-hour trajectory which shows dispersion indicating how the air

moved. Ozone interlude is something else to consider. One usually sees a daytime peak (ozone needs sunlight) but sometimes levels stay high at night. NO_x sources (cars) can also help to drop ozone.

Mr. Gehring then discussed differences in ozone data between site 320030022 in the Las Vegas area and ozone data gathered at the Great Basin National Park. The data indicated consistently, and sometimes very significantly, higher 24-hour averages for ozone at the National Park. The Las Vegas area is nonattainment for the 8-hour ozone standard. The Las Vegas zone shows a bigger diurnal pattern.

This reflects peaks and nonattainment issues -- the area of concern here is Las Vegas -- but if one compares 24-hr averages, Great Basin is showing consistently and significantly higher concentrations than are found in Las Vegas.

That raises some questions; what does this mean for people living in remote areas, such as many on reservations; what is the impact on forest, on sacred places? Issues on the reservation for air quality that should be considered include fires, plotting trajectories of smoke over time, looking for density patterns, new sources of pollution, new pathways bringing air into reservation -- these all need to be considered.

BlueSky -- Wildfire Smoke Trajectories
<http://www.blueskyrains.org/mapper.php>
<http://vista.cira.colostate.edu/views>

Questions and Answers

Q -- For people who don't understand the trajectory and how to use it, if you've got things set up and you want to make a run, how long does it take you?

A -- It's very quick...maybe five minutes.

Comment -- So if I wanted to issue a burn permit I could look this up quickly, this seems like a great tool. Also, when you were explaining the NO_x concentration, most of the tribes live downwind of the big urban centers where we know there are attainment problems. Using a system like this I'd like to see us be able to get readings over the whole year. I think there are policy implications if you could do a lot of runs to show the picture that those of us who are being impacted in rural areas on reservation don't have the means to do.

A -- People don't know that they have the high concentrations in the rural areas. If the concentration from something upwind is causing you to go into nonattainment you can go to EPA, also file a citizen suit. It can help to go to the source and close it down -- the Mohave power plant in Nevada is an example of this. But you'd need other tools if you are trying to make a case to EPA or courts.

Comment -- Section 126 is used by eastern states affected by Midwest plants (Ohio Valley) to get EPA's attention and force more controls on sources of pollution.

Q -- What is the success of taking this to a regulator and saying you are being impacted by a source?

A -- It's difficult, you raise awareness at EPA, at regional strategy meetings, and it may not be a legal hammer, but it explains what's happening. This helps us get the monitoring we need to take it further, to find point sources. We can take this and say, here's an area of concern, a data gap, and here's some data we were able to get. The urban/ rural issue is a problem because the national network is largely urban.

Q -- What's the credibility of the HYSPLIT model? Did developers do beta testing?

A -- Yes, NOAA did. I think the origins of this were for them to figure out nuclear fall-out patterns. For me, it works; a lot of people use it, so that's important to me.

Comment -- Tomorrow we'll have a presentation showing where HYSPLIT doesn't work as well, where it gets lost, but it is a good tool. It's easy to use; it took me half a day to figure it out.

Comment -- NOAA is a good organization.

A -- Yes, but it doesn't matter how good it is, with modeling there are always going to be times where it doesn't work.

Petroleum Coke Dust Emissions from Open Boxcars along the Shoreline of North Puget Sound, Washington

Tony Basabe, Swinomish Air Quality Program, Office of Planning and Community Development, Swinomish Indian Tribal Community, LaConner, Washington

Tony Basabe has been working for the Swinomish for about 9 years. He began his presentation with some personal remarks about the conference followed by a discussion of a current project on which he is working. His remarks follow.

When I listen to a lot of these papers, with our air programs I see that we are starting to wake up the regulators. We used to see them as the agents who were protecting us, but we're now helping them to see pictures they couldn't see before. We're doing that with diminishing funds. The tribal folks here are helping to affect many things that are not tribal issues. My issue is one of these and I feel bad that I didn't notice it sooner.

For years I watched these box cars passing by, but I never thought what effect they might have. We have a pretty good air quality program. We try to integrate as much as we can. We are right next to two oil refineries and even though we are located in rural Washington, industrial areas are our neighbors. The state has no authority on the reservation and prior to establishment of the Swinomish Air Quality Program there was no monitoring there so now we are trying to fill data gaps.

Anyway, I was watching the box cars. They park right behind the casino. They park and leave the train running, get out to have lunch and then get back on the train. I noticed that sometimes we had elevated levels of pollutants and I asked the engineers to turn off the train engine but they explained the engines were old and turning them on and off was a problem. So, I called a friend at EPA and soon the trains stopped parking at the casino.

But then another issue of concern came to our attention -- petroleum coke. EPA was interested in helping us but the tribe would have to provide data. We pulled together EPA Region 10, the Swinomish Tribe and industry to collaborate and address the issue of emissions. ITEP's Bill Auberle offered to assist us with this as a class project. So far we have had one meeting with the refineries and EPA. So, this is a work in progress.

The Shell refinery ships petroleum coke by rail and barge. This presentation deals with rail transportation because the coke rail shipments cross the Swinomish Reservation within one half mile from the refinery. Since late 1983 the Shell Oil Refinery in Anacortes Washington has been shipping petroleum coke, in open gondola-type box cars, from the refinery to the Alcan Inc. aluminum smelter in Kitimat British Columbia.

Each car is capable of carrying seventy-five to one hundred tons of coke. Fifty to sixty gondola cars carrying coke are shipped a week, 365 days of the year.

- 3,750 to 6000 tons of coke are shipped weekly

- 195,000 to 312,000 tons are shipped yearly
- 4,485,00 to 7,176,000 tons have been shipped to date

It is not only the amount of material being shipped that is of concern; the shipping route is also of significance. The total rail track length from the oil refinery to the aluminum smelter is 1520 kilometers. Eighty percent of the tracks are within 1 kilometer of water. Most of the route in NW Washington and the British Columbia south coast is along the shore and in some cases directly over water.

As the trains travel through the region coke dust and large particles of coke are strewn in their wake. Before this project began coke was loaded full on the sides and high in the middle of the box cars, increasing the likelihood of spillage. A new method was proposed. At the first group meeting the refinery agreed not to overload the cars. This helped to lessen spilling of large particles but had no effect on fine particulates escaping the cars during transit because the loads in the open cars were vulnerable to wind erosion.

The reason the fine particulates are of such great concern stems from the fact that emissions from petroleum coke contain significant amounts of fine dust particles in the PM10 and PM 2.5 size range. These emissions are currently regulated by EPA in Region 10 under the FARR. Petroleum coke also contains numerous toxics including heavy metals and PAHs that are carcinogenic.

The location of train tracks on the north end of the Reservation is of special concern because of the important waterways in the area. Simple examination of the area alongside the tracks reveals large coke spills, with many discharging into water. Ten years ago there was an accident and a whole car of coke was spilled into the bay. It was never cleaned up.

Although this is still a new project the team has already made some progress. Solutions are currently being implemented including the following:

- Leaky rail cars will not be used to carry coke
- Rail cars will be loaded to lower levels
- Rail car hoppers will be inspected after loading
- Outside of rail cars will be cleaned after loading, and
- Verification of the above procedures will be entered into a daily loading log.

Impacts of these solutions are expected to lead to near elimination of coke spilling along rail tracks and adjacent aquatic habitats and fewer airborne emissions as well. All people and habitats along the coke shipping route will benefit. More solutions are planned for the near future and we hope that this work will affect awareness in the coke industry broadly.

Next Steps

- Shell Oil Company will install a binding spray station at the Anacortes refinery and apply the binder to all of the coke produced at the refinery immediately after production. The binder application has the potential to reduce more than 90 percent of fine dust emissions from handling, storage, loading and unloading and shipping by road rail and barge.
- Determination of fine dust emissions from shipping petroleum coke.
- The Institute for Tribal Environmental (ITEP) Professionals and the Engineering Dept. at Northern Arizona have volunteered to assist with fine particulate (PM10, PM 2.5) transport emissions modeling.
- EPA has agreed to assist with high resolution chemical analysis of the Shell refinery petroleum coke to enable refined modeling by ITEP.

Questions and Answers

Q – You mentioned that you’ve seen some of the same products in shellfish sediments. Are you planning on doing some sort of a sampling there?

A -- I’m talking about coke dust on the box cars but some of it is coming out of stacks, some from run-off. There are a lot of sources for what is showing up in the sediments. I don’t think it’s that easy, not that straight-forward to know how to clean up sediments. Coke shipped by rail along the Columbia river, it’s used for a lot of different industries. It’s not going away. We’re starting now, but it’s great when Indian Country can shake up the rest of the country. The binding is really easy. Making the railroad aware of potentially contaminating a lot of riparian areas, that’s important. We’re protecting our resources because it needs to be done. But it took me several years just to see this. We’re just getting started.

Comment -- Very interesting presentation, thanks for that. My comment concerns the fact that trains carry lots of things going lots of different places; lots of places use coal and coal is transported in trains. It’s different but still has a lot of the same weathering. You’ve opened up the whole idea that contaminants aren’t just coming from smokestacks or tailpipes. We have to look at the whole picture. It helps expand our thinking.

Q – Are you actively monitoring for PM emissions?

A -- No, It’s been really hard to get the money to do what I am doing. I want to, now that we have this project in place. To determine how successful this is I want to monitor the effectiveness of the binder. So, some kind of PM monitoring should happen. We have to do something about the fact that it’s a moving source. But, the issue just came to the front. The new people at EPA are saying, do it. I’d like to do particulate monitoring. There is a monitoring station about three-quarters or a mile away, I recently found out. But I don’t know if that’s close enough for this type of situation.

Comment – You might want to look at some data on children and elderly.

A – This story is just one piece of the story. When you look at a human being -- tribal people especially - - are getting pollutants at a much higher rate.

8 A.M., WATER

Facilitators:

Robert Hillger and Daniel Kusnierz

Monitoring the Water Quality at Boyden Lake after Repairing the Fish Ladder

Steve Crawford, Environmental Department, Passamaquoddy Tribe at Pleasant Point, Perry, ME

Common sense, 7th generation, gain in knowledge, profit, mother nature always prevails, equity, fairness. These are the “keywords” Mr. Crawford chose to begin his presentation. The Passamaquoddy Tribe resides in Washington County, Maine, the easternmost point in the United States. There are two locales for the Tribe, one on the coast at Passamaquoddy Bay where about 1,400 members reside, and one inland where about 2,000 members reside.

The Tribe has had two separate locales and cultural histories since the 1830s. Originally, those residing in the summer camp area accepted western ways, and those residing elsewhere did not. Now both groups accept the western culture. Each Tribe was awarded 146,000 acres and operates under Joint Council

Managers. In the Grand Lake stream area, some of the members act as guides for tourists to catch bass. They had begun to notice that the alewife population was in flux.

A fish ladder installed for the paper industry and allowed by the coastal Tribe was preventing alewives from swimming upstream into Grand Lake. The Grand Lakes Tribe wanted the native alewife population to remain stable. Bass is actually the introduced species in this area, and is used for income and food for the Tribes. However, alewives do not harm the bass population.

There have not been any previous alewife studies in southeast Maine. Boyden Lake is a 1,704-acre water body used as a drinking water source with only one stream outlet, making it ideal to count fish going in and out. The fish ladder installed there in 1974 failed within 10 years. There was a concern, however, about repairing the fish ladder – adding another 1.2 million pounds of potential bio-mass to the Lake. However, alewives are filter feeders and can improve the water quality.

The fish ladder failed from leaks in the structure. At $\frac{3}{4}$ -pound each, there was not enough water pressure for the alewives to ascend the ladder. Other concerns of the Passamaquoddy Water District at the Lake included increasing turbidity values and chlorine levels. A \$120,000 grant was secured to repair the fish ladder. The project began in spring 2006 and ran through the summer with preliminary data collection. Data will be collected again in spring through fall 2007.

An infrared underwater camera with a motion detector was used to determine if fish were going through the ladder. One issue, however, is that the camera catches groups more accurately than individuals. One camera was mounted on top of the fish ladder box and another in the fish weir in the stream. Macro-invertebrates were vacuumed from the bottom. Zooplankton samples were taken at five locations.

No alewives were seen going up the fish ladder this year.

A second, major challenge is posed by the local commercial fishing industry. When the fish ladder is fixed, local commercial fishermen use dip nets to collect alewives from the ladder box. There is a local permit to allow harvesting alewives, but some violate the permit and over-fish the streams and Lake by using the ladder box.

There is a great need for education, enforcement and outreach to stop the over-fishing.

Questions and Answers

Q – What are your future plans?

A – We will get the fish ladder problem resolved. Relations between the Tribe and the local people are not good. Funding is needed for the Passamaquoddy Water District to enforce the ordinance. We will contact the state to monitor this and get good data next year.

Q – Canada has a different philosophy regarding the importance of having alewives in the waters. Have you had any exchange with Canadian Tribes or the government?

A – Canadians like to use alewives for food. We're now finding that alewives are good fodder for bass, so having alewives in the Lake is good.

Q – Some want to remove the dams from the Penobscot River system to bring back salmon, but it would also bring back alewives, impacting the food supply in the area. Some studies show negative impacts from having alewives in land-locked lakes. Why do people harvest them?

A – People use them for bait to attract lobsters. Some people smoke them or use them for fertilizer.

Potential Effects of Suburbanization on the Water Quality and Quantity of Boiling Springs, A Sacred Area to the Shakopee Mdewakanton Dakota Community, Scott County, Minnesota

Lanya Ross, Department of Land Management, Shakopee Mdewakanton Dakota Community, Prior Lake, MN

“Like my Grandmother told me, ‘It is the center, the place where you come from’,” Joseph Brewer, from a 1994 letter to the City of Savage City Planner. Ms. Ross began her presentation with this quote. She continued:

Boiling Springs is the largest sand-boil spring in the upper Midwest. It never freezes or dries out. It is the cleanest Minnesota River tributary and the headwaters of the last brown trout stream in the metropolitan area.

In 1995 the Eagle Creek Aquatic Management Area was established by stakeholders, including local residents, the Cities of Savage and Shakopee, state and federal government and nonprofit preservation agencies, to restore pre-settlement conditions in an area (Eagle Creek) bounded by residential and commercial development. Management objectives for a 400-foot buffer area established around the Spring are to filter runoff, maintain streamside plant and animal habitat, and provide residents with traditional, spiritual, and recreational opportunities.

Groundwater in the spring comes from a much larger area, however. In 2001 a groundwater flow model was used to find out where the water in the Spring originates. Precipitation in southeast Scott County flows to the Minnesota River. The area was glaciated at one time so there are large, sandy beaches, rocky till uplands and silty clay till outwash. The bedrock is the Shakopee Formation with a carbonate aquifer and the spring is at 740 feet. Pressure under the ground causes the water to “boil” or erupt.

Study objectives were to collect discharge and water quality data at Boiling Springs with analysis parameters determined from nearby land uses, and compare the data to existing data (none prior to 1990) and determine whether there is a negative impact from adjacent suburban development.

In 1970, contamination was primarily from agricultural chemicals, soil erosion, and road maintenance. By 2000, contamination was primarily from lawn chemicals, soil erosion and road maintenance. Quarterly water quality sampling along with discharge, stage and Hydrolab measurements began in 2004 at locations upstream and downstream of the Spring. Additional discharge, state, and Hydrolab measurements were made weekly between April and November 2004 and every other week from December 2004 to April 2005.

Results of the analysis between 2004 and 2005 show the discharges are highly variable at the Spring, even though stream flow is not decreasing. In addition, pH is constant at all sites over the year. Temperature is up and down with seasonal weather effects, and dissolved oxygen is lower at the downstream site. Chloride levels are increasing at all three sites. Chloride was found in all groundwater samples and in storm water ponds. Chloride may be leaking from the ponds.

Boiling Springs is fed by innumerable small seeps that coalesce into a small stream. The water is affected by exposure to the atmosphere and surface runoff. Magnesium and calcium levels were constant. Nitrogen was very low at all sites. There was a slight rise in phosphorus. There were non-detect values of suspended solids and chlorophyll-A, so the tributary is still very clean. But the “boils” or discharges are not as robust as they had once been.

Newspaper articles describe Boiling Springs in the late 1800s as having boils up to four feet high, with seven boils occurring simultaneously, and the pool was 20 feet deep. Now the boil height is about a foot and one-half with only four boils occurring and the depth is one and one-half feet. The Spring was lower than ever in 2005, according to anecdotal information, and there was a drought in 2006.

The Spring had been fed by iron-oxide tubes underground, which were cut during the construction of a nearby housing subdivision. The Spring has not been as active as before the construction disturbance. It is a challenge to give the data meaning. The Land Department works with local summer camp programs to make observations at the Spring. Education for children about the Spring has been provided for several summers.

Next Steps

- Make Boiling Springs a part of the oral history
- Take high-frequency spring discharge measurements
- Obtain funding for age-dating spring water, and
- Monitor high-frequency water pressure changes to determine if the boil is changing or decreasing.

Questions and Answers

Q – Are there other indicators being collected, like biological data?

A – The State of Minnesota is doing regular data collection on invertebrates and fish.

Q – What does the state biological information add to your study?

A – The state has seen no major changes.

Comment – The state's data should be integrated into assessing how and when to sample in the future.

Q – Do you monitor water quality from drinking water wells?

A – We do not have funding to do that.

Q – The biota is unique to the Spring. Could partnerships with other agencies, like Department of Natural Resources, result in funding under legislative research programs?

A – The challenge is to work with the cultural resources department regarding land use. There is overlap here, but the areas are still being treated as separate entities. No data is collected in the spring because it is a sacred site.

Comment – Don't use old data because it gives false perceptions. Just use recent data. Your discharge can't be increasing because of a larger amount of impervious area now.

A – We want to put in a float system or a weir but there is too much debris and no funding. We want community volunteers to help. Our number one management goal is to maintain the Spring in its natural state so that people don't want to modify the stream in any way. We're missing high frequency pulses.

Q – Has the chloride increase had any impact on plants or animals?

A – The state is not seeing an impact yet, but we need to look more closely.

Q – What about mitigation?

A – The Department of Natural Resources would do this, but we need to raise our voices and get funding to make that happen.

Comment – With the urban influence, changes could be long term, so you may need a larger sampling window or time with more sample wells. Keep taking data longer and look closely at it.

8 A.M., TRAINING: RISK ASSESSMENT AND EPA/TRIBAL CASE STUDIES

Facilitators:

Tony David and Rita Schoeny

The instructors explained that the tribal risk assessment training session would be divided into two parts. The morning session was basic training presented by EPA that focused on tribal issues, and the afternoon session focused on case studies presented by the tribes. The training allowed for audience interaction, tailored for the tribes, and included tribal examples.

Risk Assessment Overview

Rita Schoeny, US EPA, Office of Water, Washington, DC

The first presentation provided an overview of the risk assessment process in the federal government, including a short explanation of how the process varies within agencies and divisions. The framework for assessing carcinogenicity was explained as were “mode of action” and required key events. Dr. Schoeny also explained dose-response relationships and how they are applied to children and adults.

8 A.M., TRAINING: DATA MANAGEMENT FOR WATER MONITORING

Facilitators:

Elizabeth Wendt

Tribal water quality programs across the nation are functioning at different levels. Some are just getting started, whereas others have been conducting monitoring for years. No matter the program status, one question is heard nationally—What do I do with the data?

Data management is a term used generally. It can be interpreted in many ways. For purposes of this training session, data management is the process of converting monitoring results into a useful set of data that can be used to make decisions about programs. This session was to provide information on managing data, including how to compile useful data sets, storing and managing data in an electronic format, validating data, and reporting results. The training session included the following topics:

- Tribal Clean Water Act 106 Guidance Overview
- Data Storage
- Data Assessment/Analysis
- Data Reporting
- Data Display/Presentation

The training covered basic and complex aspects of data management and provided an excellent overview of components of a successful data management program including the new tools, requirements and components of the Clean Water Act 106 grant program. This training was “tribally driven”; it was requested by the TSC Tribal reps and EPA agreed to coordinate the training regardless of the state of change and transition that the EPA’s CWA 106 program is currently undergoing. It is entering a new era of managing data and providing a new guidance to Tribes. The Tribal presentations were highlights during the training; the real world stories provided the best overview of excellent monitoring programs that other tribes can model their programs after. These examples of Tribes with advanced water

monitoring programs were inspiring (although somewhat intimidating) to the many tribal environmental professionals at the training. Nationwide representation provided a broad scope of abilities and questions but also provided an excellent forum for posing questions and concerns that training coordinators recorded for the EPA water program to help address in a Question and Answer document. EPA agreed to address the concerns in a timely manner. EPA then committed to provide any and all materials from this training onto a website about the TSC Conference with the proceedings.

Tribal Clean Water Act (CWA) 106 Guidance Overview

Carol Russell, US EPA, Region 8, Tribal Water Quality Team, Denver, CO

EPA Clean Water Act (CWA) Section 106 grants fund the establishment and operation of water quality programs. EPA published draft guidance for tribes early in 2006. The guidance seeks to help tribal water quality programs at various levels of sophistication and development. In addition, the guidance outlines new reporting requirements and data expectations for all tribal programs receiving Section 106 funds.

Data Storage

Eric Wilson, US EPA, Region 9, Office of Water, San Francisco, CA

The Data Storage portion of the Data management breakout session covered three areas. First were the basics of sound data management. Monitoring data requires three pieces of information to make these data usable and to inspire confidence in the quality of the data. The first piece is a brief summary of the monitoring project. This refers to an organization's monitoring plan and states the title of the plan, where a copy can be obtained from, and the purpose of the monitoring.

Monitoring data will not be especially useful to your program unless you are able to store your results in a format that allows you to manipulate, summarize, and analyze them. He presented a STORET Update and summary of Migration tools and data storage Template options. The Data Storage portion of the Data Management breakout session covered three areas (the last portion is covered in the Data Reporting section of this training summary). First were the basics of sound data management. Monitoring data requires three pieces of information to make these data usable and to inspire confidence in the quality of the data. The first piece is a brief summary of the monitoring project. This refers to an organization's monitoring plan and states the title of the plan, where a copy can be obtained from, and the purpose of the monitoring.

10 A.M., INDOOR AIR

Facilitators:

Christine Berini and David LaRoche

Tribal Science in Action: Case Studies from Bois Forte Environmental Services IAQ Program

Kevin Koski, Bois Forte Tribal Government, Department of Environmental Services, Nett Lake, MN

Mr. Koski presented two case studies discussing the tools and techniques of the model Indoor Air Quality Program at Bois Forte, deemed a Center of Excellence by EPA Region 5. The first dealt with the renovation of a 30-year-old mold-infested home with a wet Preserved Wood Foundation (PWF) and the second focused on using blower door airtightness tests, infrared thermography, visual inspections, and building codes to diagnose construction flaws in new homes.

His remarks follow.

If you put things in the ground they are going to turn to dirt. Houses with PWF's were designed for use in California, where it is hot and dry most of the time, not Minnesota, where it is cold and wet. This case concerns remediation of a house with PWF on the Bois Forte reservation – one of many like it. The house was built in the late 1970's and is now occupied by a husband, wife, and their three young sons. A wood foundation works as wood is meant to work -- just like a tree it wicks the water up from the earth through capillary action. Wooden beams suck water up, and insulation becomes saturated. Mold forms throughout the entire structure, causing illness. All family members were sick with chronic upper respiratory and sinus problems and anyone who visited got sick too. The children were sent away to stay elsewhere in the summer because the problem was so bad.

The house in this case is badly situated, below the road, in rock and clay; its gutters are without downspouts so all four corners of the house are splattered with water every time it rains. This house is getting inundated every time it rains. Ideally, to remediate a situation like this, one would jack up the house and redo the foundation with new materials. But, this is often unaffordable so we tried to come up with an alternative...a ventilation chamber. We opened the walls, removing 12" of sheetrock and insulation. Then we installed blocking to hold up existing insulation. The new wall was faced with cedar to facilitate drying and the chamber was caulked. We then introduced dry air at one end of the chamber (with a dehumidifier) and exhausted (in this case with a hair blower already in the house) it on the other end. This created a continuous airtight chamber around the house's perimeter. One portion was passively ventilated. Readings for Initial Moisture Content were:

- Average sheathing moisture content was 29.7 percent (High of 57.3 %)
- Average bottom plate moisture content was 46.2 percent (High of 97.5%)
- Average 2 x 6 moisture content was 36.4 percent (High of 99.9%)

The caulked chamber MUST be maintained with the dry air or it will be filled with mold. Testing ports were installed so that we could check air quality inside the chamber and alleviate pressure in it as well. Three weeks after installation we saw dramatic results.

Our reservation housing department is really responsive; the housing director was open to suggestion and understands the importance of addressing indoor air problems. The public works department addressed the problems of the ditch and grade of the yard from the road, the gutters were repaired and a trench was dug to pull water away from the house.

Another problem with much of the housing on the reservation is heat loss. Blower door technology is something tribes should know about. We had houses that were way over budget and performing horribly, losing huge amounts of heat. Blower door technology tells you how much air leakage there is in a house and pinpoints where. Then you can caulk, insulate, and so on, to improve the way the home retains heat. Residents complained of the following problems:

- Cold floors throughout the house
- Cold bedrooms especially adjacent to the attached garage
- Cold kitchens
- Drafts entering the house around doors, windows and sliding glass doors, and
- Cold air coming in through the range hood exhaust fan.

Several families reported going through an entire 300 gallon tank of propane in just over a month. Some reported going through as many as five tanks over the entire heating season (at a cost of over \$500 per tank).

So, houses were closed up, windows locked, and a Tectite blower door system and pressure gauge was attached and then the house was depressurized. Infra-red readings were taken at 8 different pressures (50 down to 15 Pascals) as we searched for air leaks. All 20 homes that were checked were found to have consistently poor air tightness values, including in these specific areas:

- Penetrations into attics
- Top plates in attics
- Around windows and doors
- Air plenums
- Around sill plates, and
- Around electrical boxes.

Compared to the airtightness portion of the Energy Code (adopted to the MN State Building Code April 15, 2000), the homes were all found to be between 3 to 5 times leakier than the building code allows. The energy portion of the Minnesota State Building Code has distinct prescriptive requirements for air-sealing as well as a numerical airtightness standard, one of which must be followed by residential building contractors:

Prescriptive Requirements. In the MN State Building Code, Minnesota Rule 7670.0470, Subpart 7. Air Leakage, item B., (sub items 1 & 2), it states that all Category 1 buildings such as these “must be sealed around window and door frames, between wall cavities and window or door frames, and at utility penetrations”. In addition, they must be sealed “between wall assemblies and their rim joists, sill plates, foundations; between wall and roof/ceilings; and between separate wall panels”.

All 20 homes were inspected. Building inspection findings revealed the following code violations:

1. Missing Insulation in the Crawl Space Walls
2. Missing Vapor Barrier in the Crawl Space Walls
3. Missing Insulation on Foundation Walls Above Grade
4. Missing Sheathing in Crawl Space Walls
5. No Air Sealing at Sheathing Penetrations
6. No Air Sealing at Top Plate of Walls
7. No Air Sealing at the Doors and Windows
8. No Air Sealing at the Sill Plate
9. No Sealing Behind Electrical Boxes
10. Poorly Installed Insulation
11. Covered Heat Registers (Missing Grilles)
12. Missing Heat Ductwork and Grilles
13. Missing Insulation, Duct Seal and Grilles, and
Undersized Grilles
14. Poorly Installed Furnace Filters
15. Heat Recovery Ventilators Improperly Hooked Up
16. Incomplete Final Cleaning
17. Range Hood Exhaust Fans Improperly Installed

In addition, we reviewed architect’s drawings, project specifications, and contract documents. We prepared a detailed and fully illustrated inspection report, including all inspection findings, infrared images, blower door data, code quotes, drawing & spec quotes, and punch list for renovation work. We

attended planning meetings with Housing representatives, Tribal Council, and the Tribal attorney then sent reports out to architects and general contractors. We also attended meetings with the Tribal representatives, architect, contractor, and subcontractors who were responsible for fixing the problem. Finally, we approved a scope of work for renovations and supervised some of the renovation work.

Questions and Answers

Q – We have some of the same issues, can you give me an idea of what the BTU was of the air exchanger. What's the system that you are using?

A – Those air exchangers are about 1000 btu. They are bigger than you need for a house that size. And just an ordinary \$200 dehumidifier. We channeled it into the chamber.

Q -- Are the readings in the 20's that you got going to be sufficiently low to keep mold from growing?

A -- We would have liked to see it under 20.

Q -- What is the maintenance and cost?

A -- We are going to watch their energy records for the year and see. The system doesn't run constantly; it's on two hours/ off two hours. Ideally we'd like to have some kind of sensor so that it only runs when the moisture content is higher. To train the family how to monitor would be great.

Q – What was the initial cost?

A – For materials \$3,000, labor \$3,000. The exhaust fan was already in place. In Canada they used the fans that you use for radon mitigation but they didn't pull enough air, so they had to use a few.

Q -- How big was the house?

A -- About 24'x 24'

Q -- Did you see any improvement in the sick kids?

A -- Yes.

Q -- Did you get any complaints about noise?

A -- No. We did find that we were pulling too much air and getting some soil vapors, so we had to adjust that.

Q -- Did you have any problems with variations in measurements of the wood?

A -- No, it wasn't very scientific. I isolated the bottom plate from the 2 x 6's and sheeting, looking at ballpark numbers, and mostly looking for improvement. This wasn't scientific data.

Q -- Did you consider using a rheostat?

A -- I just turned down the fan that was there, and used a different setting.

Q -- Why didn't they use the air exchanger? Was the family concerned about the costs?

A -- We're monitoring that, but it only costs about the same as a light bulb. If we do more of these houses we'll probably look for something different. We used the air exchanger just because it was there. It was an experiment. So far, it is better than it was. Is it as good as it should be? Not yet.

Q -- Did you check for radon?

A -- Yes, there was a lot of radon testing in the area a few years ago and there wasn't very much.

Q -- Does mold grow on concrete also?

A -- If there is dirt or grit on it, it could. I cleaned off everything but we didn't want to seal anything off, we just wanted it to dry.

Q -- Will mold grow on plastic?

A -- Some plastics, if they break down or decompose a little bit. Some molds can grow on them a little, but really, all you need is a tiny bit of dust...and the mold grows right on top of it.

Q --It sounds like you did a lot of work to find out what happened in the houses that were losing a lot of heat. As a result of this did you have some kind of guide for homeowners or contractors?

A -- These are all housing department owned and we're pretty involved in the construction now. One of our long-term goals is to get a building code for the tribe that all the contractors and architects have to follow. But the thing we really need is an on-site building inspector to ensure that code actually gets followed. We're one of the EPA Centers of Excellence so they recommend other tribes come to us.

Comment --For their indoor air quality, if you can encourage your tribes to adopt building codes you have more control over your contractors.

A --We need to push for more indoor air buildings inspectors.

Mold: Mycotoxins, Indoor Air Health Crisis in Indian Country

Curtis Munoz, Kiowa Tribe of Oklahoma, Environmental Program, Carnegie, OK

Mr. Munoz, a member of the Tribal Science Council, opened his talk with a brief discussion of the Council and how his involvement on the Council has facilitated his work as a scientist. He then proceeded to describe his current research into the problem of mold in Indian Country.

His remarks follow.

There are nine science priorities that the TSC is focusing on for Indian Country. These priorities are what the TSC sees as common environmental science issues that are common to all tribes across the nation. These issues are addressed with goals from identification to remediation of the problems that effect the environment and human health. While a lot is known in the area of outdoor air quality in the EPA, with the Tribal Programs emphasizing monitoring and gathering outdoor air data, little is known about indoor air quality. Even less is known about mold and its effect on indoor air quality, especially in Indian Country.

In traveling around the nation to different Indian tribes and Nations, I kept seeing the problem of mold in Indian housing. Many told of how they would get sick while at home, but felt good when away. The same physical ailments were appearing, regardless of the diet of the people.

Could mold really be causing these people to get sick? Could it be? I began to look and find if there was a connection. I knew mold and fungi were known in small circles to be causes of contaminants in certain foods due to their mycotoxins. Could these molds/fungi and their mycotoxins be causing the air inside the homes to become contaminated? Is this contaminated indoor air quality affecting the health of the Indian people, causing the different sicknesses of those living in these indoor environments?

Being selected to the EPA National Tribal Science has given me the chance to look into the mold issue in Indian country. What follows is what I have found so far in my journey to get our questions asked about how mold and fungi affect indoor air quality, and how this effects our personal health.

On the Pine Ridge Indian Reservation, mold has been found in 75 percent of the 1,700 tribal housing units. Health effects range from chronic sinusitis, severe headaches, fungal skin infections in children and elderly, and upper and lower respiratory illness, and reports of elevated cancer cases, and diabetes worsening. Mold is causing many tribal members to become sick. The diabetes epidemic on the Pine Ridge Indian reservation alone is 800 percent higher than the US national average of diabetes in a population.

A community of 153 houses east of Browning, Montana was found to be contaminated with black mold. These houses were built on wooden foundations. Mold was so bad in one house that one-foot mushrooms were found growing in the basement carpet. Candace LaMott's mother, who lived in the house, took ill and died three years ago. She says her son suffers from severe headaches, and two grandchildren living in the home "have difficulty breathing."

Jamie LaPier complained of frequent headaches that sometimes last for days. Her husband, Gale, says he's also been getting "strange" headaches the past two years. They say their son, not quite four years old, gets unexplained nosebleeds up to 20 times a month. The woman who lived in their house before them died of cancer.

Others who reside in the wood-foundation homes, which are scattered across the reservation, report ailments ranging from constant sore throats to asthma and other respiratory distress, odd bumps and lumps, general fatigue, dizziness, and a host of other maladies ranging from kidney disease to cancer.

On the Turtle Mountain Indian Reservation, in Belcourt, ND, 320 federally subsidized homes are infested with mold. Residents say the infestation is sickening them, and tribal officials say at least seven deaths in recent years could be related to the infestation. Most (210) of these homes will have to be destroyed. Most of the infested homes are small - about 600 square feet with two bedrooms. They are built of wood-frame construction, have dirt floors and sit on a concrete block foundation over crawl spaces. Tribal officials are worried about the black mold, causing flu-like and allergy like symptoms, which include skin rashes, inflammation of the respiratory tract, bloody noses, fever, headaches, neurological problems, and immunosuppression.

Even energy efficient homes are not off limits to mold. In Navajo Nation, Greasewood Springs, Arizona 25 homes had to be vacated and repaired due to mold infestation. "Energy efficiency was a big push ... making the home the most energy efficient as possible" Jelina Petzinger said. But condensation forms if the house is "too tight", she said, and subsequently, mold does as well. "Any home that did not have a wood stove (has the problem)," Petzinger said. "The stove allows air to escape."

I can show many more examples across this country, but will share a personal experience. I was called to come see a home where mold infested the walls and bathroom. Within 10 minutes I had to go outside and get fresh air because my chest began to tighten up and I developed a massive headache. I had been infected with mold from concrete dust in late 1999, and I knew what mold could do from experience. This situation at this Kiowa tribal house brought back scary emotions to me. Is there a connection?

Many tribal people see a clear connection between mold and sickness because we see through different scientific eyes. Western science, via the CDC, does not see a connection I am told, because they do not have enough "statistical power" to take a stance. Western science needs a number, while Traditional science sees the spiritual connectivity of all things. But new information and research is coming forward in the new science of the mold/fungi mycotoxin field.

Fungi, mold in this specific case, are in a completely different kingdom of organisms called *Eumycota*. They are eukaryotic having a well defined nucleus enclosed by a nuclear membrane, and the cells contain a cell membrane and the various cellular organelles making them similar to animal cells.

Molds are found virtually everywhere in the environment (over 200,000 species of fungi have been catalogued by scientists, and at least 200 of these have been identified as familiar pathogens). Molds break down organic waste, and because of this they are readily found in building materials ranging from wood, drywall, stucco, sheetrock, wall paper, ceiling tiles, and the list goes on.

Whereas much is known of viruses and bacteria, little is known of mold/fungi concerning indoor air quality. New research is coming forth showing a distinct link between mold and human health and disease. For example, researchers at the Mayo Clinic discovered that fungi, and not bacteria, are the culprit behind chronic sinusitis. According to a recent Mayo Clinic study, one in seven Americans suffers from acute fungal sinusitis. There are 4 genera of toxigenic molds that are frequently found at higher levels more indoors than outdoors:

Aspergillus
Penicillium
Stachybotrys
Cladosporium

The mycotoxins that these molds release into the environment are the culprit causing sickness in mold infested housing across Indian country.

These are toxins produced by molds to defend against enemies in nature, which are bacteria, viruses, and other organisms such as dust mites. The well known mold *Aspergillus* produces powerful carcinogens including aflatoxin, the only mycotoxin regulated in America, and is the most carcinogenic chemical known to science. Mycotoxins are relatively large and non-volatile molecules (do not readily release into the air themselves), so direct contact is mostly required. Molds do, however, release spores containing mycotoxins into the air. FDA has set maximum allowable levels (MALs) of total aflatoxin in food commodities at 20 ppb. The MAL for milk products is 0.5 ppb. Their toxicity and carcinogenicity are believed to be related to inhibition of nucleic acid synthesis. If you have eaten 40 tablespoons of peanut butter, you have experienced a one in a million risk of dying from aflatoxin poisoning or an induced cancer.

Aspergillosis is a large spectrum of diseases caused by members of the genus *Aspergillus*. The three principal entities are allergic bronchopulmonary aspergillosis, pulmonary aspergilloma, and invasive aspergillosis. Aspergilloma is a very different disease also caused by the *Aspergillus* mold. The fungus grows within a cavity of the lung, which was previously damaged during an illness such as tuberculosis or sarcoidosis. Any lung disease that causes cavities can leave a person open to developing an aspergilloma. The spores penetrate the cavity and germinate, forming a fungal ball within the cavity. The fungus secretes toxic and allergic products that may make the person feel ill. The person affected also may have no symptoms (especially early on). Weight loss, chronic cough, and feeling rundown are common symptoms later. Coughing of blood (hemoptysis) can occur in up to 50-80 percent of affected people. The diagnosis is made by X-rays, scans of lungs, and blood tests.

Tricothecenes inhibit protein synthesis in a variety of eukaryotic cells. This family of mycotoxins causes multiorgan effects including emesis and diarrhea, weight loss, nervous disorders, cardiovascular alterations, immunodepression, hemostatic derangements, skin toxicity, decreased reproductive capacity, and bone marrow damage. During the 1970s and 1980s, the tricothecene mycotoxins were shown to be

biological warfare agents when they were implicated in “yellow rain” attacks in Southeast Asia.

Black Mold, or *Stachybotrys chartarum*, is a cellulolytic saprophyte with worldwide distribution. Frequently isolated from paper, wallpaper and gypsum wallboard in buildings or residences that experienced water damage, the fungus produces several mycotoxins (highly toxic macrocyclic trichothecenes and related trichoverroids) as well as immunosuppressants and endothelin receptor antagonists. Its harmful effects on animals and human beings have been studied since the 1930s.

The science and studies on mycotoxins are still in their infancy. Most of what is known is on exposure to single mycotoxins in a laboratory setting. In real life situations, there is multiple exposure to mixed mycotoxins. This increases the health risk. If mycotoxins are not bad as some still say, why does OSHA require wearing special NIOSH respiratory masks for workers cleaning mold infested buildings? What is known: the presence of competitive organisms may play a role, as some molds grown in monoculture in the laboratory lose their toxic potency.

Humans are not the primary targets of molds, but are caught in a crossfire of biochemical warfare between mold species and their enemies in nature each fighting for similar ecological niches. Human health is affected when exposed to this mycotoxic war in indoor air.

The effects of multiple exposures to a mixture of these mycotoxins, combined with synergistic effects of these biochemicals, are now being seen in Indian country due to the indoor air quality crisis. Certain species will eat urea-formaldehyde insulation for dinner. When the fungi digest the urea portion to get their nitrogen source, the formaldehyde portion is left behind; in this case the mold indirectly affects people by releasing concentrations of formaldehyde into the indoor air.

When a Tribal member goes to the doctor for chronic sinusitis and is prescribed an antibiotic for a condition caused by a mold/fungi it only makes the condition worse. The antibiotic kills the good and bad bacteria, giving mold more opportunity to cause damage to their body because there are no good bacteria to keep the mold numbers in check. Then digestive problems start and the immunosuppressive effects of the mold kick in and proliferate. This opens the door for opportunistic infection and the person's health decline even more. The weakened immune system no longer fights off infection, and internally within the genes and with carcinogenic effects of other mycotoxins you have a health crisis when the tumors appear.

We see that mycotoxins are cytotoxic, affecting protein synthesis, DNA, RNA synthesis, hepatotoxic, nephrotoxic, immunosuppressive, carcinogenic, mutagenic, teratogenic, neurotoxic, and that this is a new field of study. The health effects are controversial at the present moment, but time will prove that a thorough study in indoor air quality focusing on mold and mycotoxins will benefit all people.

The CDC's Statement on mold:

During the past few years, there has been increased concern related to exposure to specific molds that produce substances called mycotoxins. Health effects related to mycotoxins are generally related to ingestion of (eating) large quantities of fungal-contaminated material. There is currently no conclusive evidence of a link between indoor exposure to airborne mycotoxin and human illness. It is important to note that many molds can potentially produce toxins, given the right conditions. Some molds that produce mycotoxins are commonly found in moisture-damaged buildings; research related to the importance of these findings is ongoing. Although the potential for health problems is an important reason to prevent or minimize indoor mold growth and to remediate any indoor mold contamination, currently there is inadequate evidence to support recommendations for greater urgency of remediation in cases where mycotoxin-producing fungi have been isolated.

The EPA's Office of Indoor Air and Radiation has developed a web site dedicated to the mold issue and has also produced two documents dealing with mold. The web site is located at <http://www.epa.gov/mold/moldresources.html>. The two documents are also located there and are (1) "[A Brief Guide to Mold, Moisture, and Your Home](#)" and (2) "[Mold Remediation in Schools and Commercial Buildings](#)". Both documents can be downloaded using the PDF format. The web site also lists other resources that are available.

Next Steps

- The fact that mold in Indian housing is a very big problem is no surprise, but the health of the Indian people being affected by the mold/fungi and their mycotoxins is a surprise to many outside Indian country. The environmental impact of these organisms and their metabolites, how they affect indoor air quality and human health is the primary concern of the EPA National Tribal Science Council.
- An organized effort needs to be launched in Indian Country to look into this issue, which affects tribes across the United States.

Questions and Answers

Q -- What can you do if you've got mold in your house? I've been hearing about black mold for years and have it in my building. But you're saying that it's being suppressed.

A -- Well, this is the CDC statement that came out *after* Katrina.

Comment -- What I'm hearing is that there is suppression because of the potential cost of remediation; people say that this might be the lead or asbestos of the 21st century.

A -- Insurance companies don't want to be liable. We need to be sure that we vote for the right people to deal with the problem.

Q -- I'm curious to know the prevalence of mold outside Indian Country. I mean, once it affects other people then maybe there will be some action.

A -- Well, it is a problem especially if you don't have money.

Comment -- Data on asthma rates in Indian Country could also be related. There is data out there, but it's about what you do with the data.

Q -- EPA has very limited regulation as far as mold, basically for schools, but for individual homes, there's nothing as far as I know.

A -- I think that's right, I'm just getting into this. If anyone has any ideas or information I hope you'll get in touch with me.

Comment -- I think the key isn't money, but statutes. We need Congress to pass a law to establish standards and remediation. Include something on Indoor Air in the Clean Air Act.

10 A.M., WATER

Facilitators:

Robert Hillger and Daniel Kusnierz

Developing Reference Water Quality Conditions for the Pueblo de Taos, New Mexico

Robert Gomez, Environmental Director, Taos Pueblo, Taos, NM

Jeff Ogburn, Taos Pueblo Environmental Office, Taos, NM

This presentation focused on developing water quality standards, identifying reference water quality conditions and maintaining good water quality on the Pueblo of Taos Reservation in north central New Mexico.

A synopsis of the remarks given by Messrs. Gomez and Ogburn follows.

There are 19 Pueblos of New Mexico, which have existed in harmony with the land and water since time immemorial. Clean water is of great importance to the Tribe and its lifeways, and all things are seen as inter-connected.

Pueblo peoples have lived in west and central New Mexico, eastern Arizona, and western Texas. They were sedentary farmers who lived closely together in permanent towns. Prior to the time of Columbus, the people traded over vast distances. Macaw feathers and seashells were obtained through trade and are still important to the Pueblo people today.

The Pueblo of Taos was designated a UNESCO World Heritage Site in 1992 and was placed on the National Register of Historic Places in 1960. It is the largest of the eight northern pueblos containing 119,000 acres and 2,410 members. About half the Reservation is in the mountains and includes Blue Lake and Bear Lake along the Rio Grande gorge. Taos Pueblo lands are between 7,600 feet elevation and 13,000 feet.

The Tribe lives along the Rio (River) Pueblo and has maintained the waters in a clean and healthy condition throughout its history. A survey in 2000 indicated that over 94 percent of Pueblo residents consumed surface waters directly from the River at some point during the year. Blue Lake is a religious site. When Theodore Roosevelt took Blue Lake for the national forest system, the Tribe had to get a permit to go there. This was a great affront to the people.

In Congressional testimony, the Pueblo elders have said that the U.S. Forest Service (USFS) “proclaims the supremacy of man over nature; we find this viewpoint contradictory to the realities of the natural world and to the nature of conservation. The idea that man must subdue nature and bend its processes to his purposes is repugnant to our people.” USFS multiple use policies have brought problems to the watershed with timbering, grazing, mineral exploration, and pollution.

In 1970, President Nixon returned the sacred Blue Lake to Taos Pueblo. Since then a 48,000-acre tract in the watershed has been managed under the Wilderness Act. The Nixon era also produced the Indian Self-Determination Act. In 1990, Taos Pueblo and the eight other northern Pueblos applied for treatment as a state under the 1987 Reauthorization of the Clean Water Act, Section 518.

Soon after, the Pueblo of Isleta’s water quality standards (WQS) were approved by EPA. Taos Pueblo opted to develop a set of its own WQS germane to its lands and designated uses. Until the mid-1990s, no monitoring program existed. With the help of River Watch Network, a nonprofit watershed conservation organization, Taos Pueblo was able to design a Watershed Study Design, a living document to be revised throughout a water quality assessment process, and set water quality standards.

In the assessment process, the Tribe first determined the goals for the watershed and incorporated Tribal knowledge, such as river use sites and plants collected, into the monitoring design. Traditional knowledge was used to establish designated uses, such as for drinking and spiritual use. Next the Tribe gathered information on watershed stressors and response indicators, like algal blooms and changes in plants.

In upgrading data to information and knowledge, current conditions were compared to expected conditions. Healthy waters and impaired waters were identified, and a protection/restoration plan was developed to tell the story of the waters. The assessment is revisited regularly to determine if data quality objectives (DQOs) are being met and whether information is being turned into knowledge about how to manage the watershed.

Thus, a baseline was built to determine the attainment of WQS, using biological, toxicological, physical and chemical indicators. Reference conditions were the benchmarks set to compare current conditions found in the watershed. One unexpected event occurred during the study design process. In July 2003, a fire burned over 5,300 acres of forest along the Rio Pueblo. An aerially-applied hydromulch was used for recovery.

The assessment plan had to be changed to reflect different terrain, vegetation, and the impact of the fire on water resources. Flooding occurs after a fire, so a damage mitigation plan had to be developed. The Tribe is investigating the content of the hydromulch to ensure that it will not contaminate the waters. Under U.S. patent law, however, the company does not have to reveal the product's composition. The company says the product is made of an ingredient that is ubiquitous in the environment. The Tribe is investigating.

After the fire, the Tribal Environmental Office changed the sampling design to monitor sites below, adjacent to, and above the fire damage. Sediment and water samples from the Rio Pueblo in 2003 showed significant mortality and toxicity to aquatic organisms. The \$4 million hydromulch did not work. On-going concerns are sediment deposition in the River and stream bottoms, toxicity, and fish populations that relocated from areas below the fire. Anxiety about the hydromulch composition persists, as well as concern that the river water is unfit for consumption.

Taos WQS were adopted in 2001 designating existing and attainable uses for Pueblo waters, and setting numeric and narrative standards associated with Tribal uses. The Tribe's WQS were approved by EPA in June 2006. Four to five years of data has now been collected. The state was monitoring only the lower watershed. Impacts have been noted from livestock/agricultural runoff, irrigation ditches, septic systems, and urban development.

Now direction is needed from the Tribal leaders about whether to impose zoning or land use controls in the watershed. The city and state won't mitigate urban runoff problems. Monitoring is now done above and below the watershed to determine where problems are coming from. Turbidity tends to increase in heavy snow years with readings between 40 and 60, while the standard is 10. The pH and the temperature of the River are slowly rising. Total coliform has always been high. Most of these impacts are from the fire.

However, overall water quality at Taos Pueblo is considered good to excellent. Water quality degrades as it moves downstream and through the burned watershed area. Only radium-228 and aluminum were found at levels above the WQS criteria. High levels of both are a natural result of a fire, according to scientists that the Tribe consulted with, and normal levels should return in one to two years.

In summary, for a high quality coldwater fishery, designated uses must be monitored and can be impaired in the future by a number of factors: Temperature/dissolved minerals, recreation and tourism activities, riparian and upland grazing, septic tanks, natural sources, land disposal, land development, highway maintenance and runoff, habitat modification, grazing, construction, bank and shoreline modification/de-stabilization, and agriculture. Much data is being compiled that had not historically been gathered.

“We are a people who live on the roof of the world; we are the sons of Father Sun, and with our religion we daily help our father to go across the sky. We do this not only for ourselves, but for the whole world.”

Questions and Answers

Q – Is there much communication between Tribal and non-Tribal offices?

A – The town of Taos has been in existence for 500 years. The Tribes have been in existence forever. Just a month ago was the first face to face meeting. There is not much cooperation. There is a lack of respect.

Q – When Blue Lake was returned to the Tribe, we also got Mt. Adams back, but the Yakima Nation had trashed the land before it was returned. Was there any damage to Blue Lake before it was returned, such as dump sites, latrines, or other impacts to the groundwater?

A – There were only recreational impacts to Blue Lake because it was a wilderness area. There was some timbering in the lower watershed, but it has healed. The water quality has gone back to a good level.

Comment – The richer white people are, the more damage they do. They bring a lot of stuff and leave it. We need to record and compare this and make people responsible for it. It would be good to collect reparations from the responsible people. Environmental damage has been atrocious to our people. Now if you start a fire, you must pay. We should monitor what pollutants come from campsites. My grandfather could bathe in and drink the Lake water.

A – Blame won't help us. We must work together. We are excited about the 319 process and bringing people together.

The Development of Water Quality Standards on the Pyramid Lake Paiute Indian Reservation

Daniel Mosley, Pyramid Lake Paiute Tribe, Environmental Department, Nixon, NV

Pyramid Lake is near Lake Tahoe on one-half million acres of Reservation lands in northern Nevada. Pyramid Lake has a lower water level today because of water diversions to turn the desert green and grow alfalfa. Fish and birds had been abundant at a second lake in the area, which dried up during the Dust Bowl in the 1930s.

Upland vegetation includes sagebrush, rabbitbrush and ponderosa pine with urban communities located in the lowland areas. Approximately 31 miles of the Lower Truckee River runs through the Reservation with Pyramid Lake as its terminus. Pyramid Lake is 115,000 surface acres. There are year-round recreational pursuits on the Lake, and permits are issued to non-Tribal members.

Improved water quality is needed for the Lake to support the Tribe's food supply – the endangered Cui-ui fish and the threatened Lahontan cutthroat trout, a large fish species that can accumulate more contaminants in its fat tissue. Under Section 518 of the Clean Water Act, the Tribe has demonstrated Council authority and competency to manage and protect its water resources. This recognition is required to apply for Section 106 funds to run a water quality standards program and do monitoring.

Since the 1940s the Tribe has filed lawsuits against the state of Nevada, and later, EPA, for not protecting their water. The Tribe has never lost a case, and some went to the Supreme Court.

The Tribe began monitoring water quality in 1981 with one person in the Environmental Department. Now there are 22 education and mentoring staff, a water quality lab and an insect lab. Ninety percent of

these programs are managed by the Tribe. As of 1990 the Tribe was treated as a state. Programs include the following:

- A four-year limnological study, 1989 – 1993
- Development of the pyramid lake paiute tribe's water quality standards in 1994
- The truckee river stakeholder negotiations with a settlement agreement in 1996
- A review of water quality standards from 1998 – 2001.

The most recent review of Tribal water quality standards included the following public involvement efforts:

- Dec. 2000 – the Tribal Council adopted a resolution for a 45-day comment period
- Jan. 8, 2001 – public workshops were conducted
- Jan. 18, 2001 – a public hearing was conducted
- May 2001 – a final revision of the water quality standards was completed including public comments
- May 24, 2001 the Tribal Council adopted the water quality standards
- July 2001 – EPA approved the water quality standards
- 2004 – the Tribe updated its application to EPA for CWA 303 & CWA 401 programs
- 2005 – the Tribe responded to EPA comments
- April 15, 2005 – the Tribe adopted the water quality ordinance updated from 1994.

In response to EPA comments, the Tribe strengthened its anti-degradation policy, included wetlands under beneficial uses and narrative standards and developed a list of all surface waters within the Reservation. The Tribe also has adopted a 0.27 mg methylmercury/kg (ppm) in fish tissue criterion in response to EPA comments. The national standard is .3 ppm.

This forces upstream entities to deal with methylmercury issues and protects Lake fish from contamination and the Lake from becoming a toxic dumping ground. Mercury is in the environment from historic mining practices. Mercury levels are now dropping in Lake trout.

In addition to the Section 101 (a) stated objective to restore the Nation's waters, the Tribe's narrative bio-criteria statement on anti-degradation from point and nonpoint source discharges emanates from a respect for water. One Tribal use of water each morning is for each person to wash his or her face in a purifying and healing ceremony. This respect has always been a part of Tribal ways.

Now Tribal members are the 2nd and 3rd generations of farmers. But they are also fish and trout eaters. The Tribe must educate its own people. The challenge was to write "who we are" into the water quality standards. All stakeholders at all government levels were invited to participate in the effort. Now education programs are being developed to educate the people about why we need to protect the water to protect our people. Outsiders also use the water, and we want it to be pure for seven generations down the road – for more than 200 years.

Questions and Answers

Q – Before the Tribal Council adopted an EPA-approved water quality ordinance, were there any interim protections?

A – We have always had good relations with the state, which helped us during the time we were waiting for standards.

Comment – In New Mexico, at Taos, both Tribal and state standards apply. In 2001 the Tribe adopted standards but waited until 2006 for EPA to approve them.

Q – Is there any chance the level of the Lake can be brought up to previous levels through restoration?

A – The Tribe is working to get access to the upstream watershed and to get water rights to restore the second Lake that is now dried up.

Q – Are you trying to get dams on the Truckee River taken out to restore water levels?

A – Yes, we need to get them removed.

10 A.M., TRAINING: RISK ASSESSMENT AND EPA/TRIBAL CASES

Facilitators:

Tony David and Rita Schoeny

The afternoon session consisted of case studies presented by the tribes. The training allowed for audience interaction, tailored for the tribes, and provided tribal examples.

A Risk Analysis for Contaminated Sportfish

Tony David, St. Regis Mohawk Tribe, Environmental Division, Water Resources

This presentation illustrated an application of the risk analysis process as it relates to sportfish consumption. Data from a fishing derby held in the Mohawk territory of Akwesasne (a reservation bordered by New York State and the provinces of Ontario and Quebec) were used in the analysis. The presentation utilized exposure models provided by EPA and shared risk management outputs of a quantitative approach. There was also an explanation of the EPA Reference Dose and the safety factors that are included in this estimation of acceptable risk.

There was a comment on the narrow focus of typical risk assessments which fail to look at multiple species of fish consumed by a target population. Experience has shown that assessments in the past have made wide assumptions about overall risk based on the analysis of a single species of fish. The focus tends to be on resident fish: fish of limited habitat ranges. Often the more frequently consumed species, especially species of cultural importance, are excluded from the analysis. This is because the range of larger fish is not representative of the contaminated area or *other* contaminated sites and may bias the results.

The importance of using Toxic Equivalency Factors for dioxins when estimating PCB concentrations in sportfish was mentioned by another participant. TEFs are used to assume that the presence of one or more dioxin-like PCBs puts forth a risk relative to the highly toxic 2,3,7,8-tetrachlorodibenzo-p-dioxin, thus contributing to the overall risk profile. Without considering the TEF the overall risk could be underestimated.

Using GIS to Measure Vulnerability and Risk Associated With USTs

Frank Harjo, Cherokee Nation, Inter-Tribal Environmental Council, Tahlequah, OK

10 A.M., TRAINING: DATA MANAGEMENT FOR WATER MONITORING

Facilitators:

Elizabeth Wendt

Data Storage (continues)

Eric Wilson, US EPA, Region 9, Office of Water, San Francisco, CA

Tribal Perspective: Region VIII Tribal Water Quality Data Management Model

Christa Tyrell, Fort Peck Assiniboine and Sioux Tribes, Office of Environmental Protection, Division of Water Quality, Poplar, MT

Dave Wilcox, Gold Systems, Inc., Salt Lake City, UT

This presentation included a review of local database development and maintenance including quality control procedures, data pathways, and data security. An introduction of the database developed by Fort Peck and other current data management approaches around Region VIII were described. The role of a web-based version of the STORET Import Module (WebSIM) and status of data migrations for tribes in Region VIII were also discussed. The current focus in this effort includes a regional warehouse, the creation of a peer-training network, and participation in the exchange network through the WQX data flow.

1 P.M., EARTH**Facilitators:**

Marshall Cheung and Thomas Baugh

Groundwater Heating in Forested Wetlands: A Pilot Study in the Hoh River Watershed

Jill Silver, Watershed Program Manager, 10,000 Years Institute, Port Townsend, WA

Jill Silver is the Executive Director and Watershed Program Manager for 10,000 Years Institute. The Institute is an international scientific research group investigating river, estuarine, and forest ecosystems and producing reliable scientific information about the effects of natural resource development on these ecosystems.

Ms. Silver explained that over the years she had become frustrated with the difficulty of trying to get regulatory agencies to enforce rules and, as a result, had become more involved in applied research to bring more science into the regulatory process. Her experience has been that bringing solid scientific information to the table helps develop better rules.

10,000 Years Institute supports citizens and organizations who seek more in-depth, focused participation in the policies and agency actions that affect public resources through organization of complex technical information to help develop scientific data to support public conservation initiatives and public participation in policy proceedings. 10,000 Years Institute scientists identify gaps in existing data and flaws in study proposals that will perpetuate unacceptable uncertainties about the environmental effects of proposed projects or policies.

This presentation of “A Pilot Study in the Hoh River Watershed” is an example of such a project. The Hoh River, located on the west coast of the Olympic Peninsula in Washington State, is one of only a few relatively healthy wild salmon-bearing rivers in the lower 48 states. Currently there are no regulations restricting harvesting in wetlands.

The Hoh Tribe consists of about 160 members, and covers less than a square mile of territory. The Hoh system is not mapped, and not protected.

The Hoh Tribe was interested in knowing more about the influence of forest practices on small, groundwater-fed salmon rearing streams. In this case, adaptive management is an important approach to

protect habitat. Perched saturation in shallow soil horizons on hill slopes is an important subsurface flow path that contributes water and energy to wetlands and small tributaries used for salmon rearing. There is more research on flow dynamics in shallow subsurface flow in forested landscapes, but it is generally limited on heat transport to streams.

This pilot study examines groundwater heat transport responses to forest management practices in the Hoh River basin. The project spent \$160,000 over about five years, including \$16,000 in gap funding. Primary objectives of the study were to investigate the relationship between forest management practices and groundwater temperature and to evaluate the relationship between groundwater temperature and heat transport to streams.

Current thinking about how streams heat is that they are heated by air. We wondered if heating might be related to soil and or groundwater temperature. A number of hypotheses were tested:

1. Ho 1 (null hypothesis): Groundwater discharge temperatures are not significantly altered by canopy removal at depths equal to or greater than 0.5 meters.
Ha 1 (alternative hypothesis): Groundwater discharge temperatures at depths \geq 0.5 meters are significantly altered by canopy removal.
2. Ho 1: Stream temperature is significantly related to air temperature
Ha:2 (general alternative hypothesis): Stream temperature is significantly related to soil temperature.
Ha:3 (general alternative hypothesis): Stream temperature is significantly related to groundwater temperature.

Criteria for sites that were chosen for the study were that they show similarity with respect to four factors:

- Soils with similar hydrologic characteristics
- Slope aspect—south to southwest
- Topography—streams or wetlands on terraces and hill slope, and
- Three land covers: stand to be harvested, mature growth similar to site to be harvested, old growth.

The Hoh watershed is about 300 square miles. For the study sites the lower two-thirds of it are in areas of forestry, homestead, and housing; the remaining third is in Olympia National Park, and is essentially an unmanaged control. Rock Creek is almost completely harvested; however, the river significantly narrows as you move into the mountains so it does vary to some degree from one end to the other. We did a forward looking infra-red but it doesn't show mixing or show streams under trees. We needed two consecutive days of full sunlight and we weren't able to get that until September. Also, the infra-red wasn't suitable for the forested areas so we used other methods. Wells at testing sites were planned to be a meter and a half deep but we dug until earth started falling into the wells and in actuality usually got between a meter and meter and half.

Site 1 was mature growth forest harvested in 2001. We weren't able to get before and after readings for this site as the land owner harvested the site before the agreed upon date. Pre-harvest installation was done 08/08/ 2001. Post-harvest installation was done 11/11/2001.

Site 2 was the control, mature second growth forest. This site has the least variability of the three sites. We installed a network of continuous monitoring equipment for soil, water, ground water, and air temperature. I don't recommend HOBO weather stations for this type of site. We had a lot of problems with them.

Site 3 was reference old growth site. The old growth area was very wet and squishy throughout the year. We had difficulty finding a site in this region to match the other sites; it had some very large macrophytes. Water flows differently through this site, and it is a higher elevation and gets more rain or snow events than the others.

We asked the following questions:

- Does canopy removal change groundwater temperatures?
- Do changes in soil and groundwater temperature affect stream temperature?
- What is the relationship between stream, groundwater, and soil temperatures and air temperature?
 - What are the primary variables & mechanisms?

Intuitively, we know that if you stand under a tree in the summer it is cooler. As I child growing up here I was always cool, unless I was at the beach or the river. And now, working in all these different areas, and a lot of clear cuts, it's definitely warmer – the climate is definitely different than it used to be. But you have to do the science to show what the effects really are.

What we showed in this study was that by 2004 the stream temperature was going down, by 2005 it had gone down significantly. We concluded that the shrub growth along the edge of the stream showed a response due to shading. This is important because of the impact it has on salmon lifecycles. 16 °C is considered to be the upper limit for spawning salmon. Groundwater and soil pre/post harvest, still remain relatively stable. We believe there is an interaction between soil temperature and groundwater.

The assumption in the general literature is that air temperature drives stream temperature, but the results from this study paint a different picture. But, here air doesn't exert a significant effect over all the parameters. Soil seems to be more variable. This is a better comparison than with air. Also, we had some really significant rain events between November 2002 and January 2003 and late October in 2003 and we are seeing some results that may be related to rain or snow events during those periods.

Another complicated variable is the issue of water flow. There's actually no other project like this in the Pacific Northwest, nothing in forestry. We are looking to compare data with other sites but will probably have to set those up ourselves. I am looking for funding and support to bring on a student and put this together into a paper for peer review.

To summarize, in light of our data, a hypotheses-exploratory analysis gives us the following results:

- Ho 2 (general alternative hypothesis): Stream temperatures are significantly related to air temperature.
- Ha 2: (general alternative hypothesis): Stream temperatures are significantly related to soil temperatures at 0.5 m depth.
- Ha 3 (general alternative hypothesis): Stream temperatures are significantly related to groundwater temperatures.

Next Steps

- Compare data from this study with data from other sites.
- Use subsurface heat transport models to examine key questions:
 - What are the primary variables affecting the relationship between canopy removal and groundwater temperature (e.g. soil depth, organic matter)?
 - Do changes in groundwater quantity and temperature affect stream temperature? What are the primary variables and mechanisms?
 - Test sensitivity of variables

- Identify potential mechanisms

Questions and Answers

Q -- I'm not sure what you mean by adaptive management.

A -- Adaptive management is a response to issues arising from regulations based on bridging the gaps between academic and applied science, a group comes together to work by consensus. You adapt the management regulations to meet specific goals that are not complete protection of our environment but take into account the political realities.

Q -- Why did you dig the wells instead of drilling?

A -- We didn't have equipment and carrying equipment would have been difficult. It was just easier.

Q -- What is the temperature for rain on snow?

A -- It gets down really low. It's never been reported in literature in streams below 600 ft but in the Ho watershed we are seeing frizell ice. There are streams there with no buffer, in areas where the canopy has been removed; this is a very bad environment for fish.

An Investigation of the Possibility of Mixing of Waters in After-Action Monitoring Wells in Ottawa County, Oklahoma

Tim Kent, Quawpaw Tribe of Oklahoma, Environmental Department, Quawpaw, OK

Tim Kent is the Environmental Director of the Quapaw Tribe of Oklahoma. Special interests of his include groundwater and surface water contaminant transport and environmental geophysics. In this presentation he describes an investigation to examine the possibility that mine water is mixing with water being produced by wells and thereby contaminating the underlying aquifers in the region.

Nine tribes were moved to NE Oklahoma from various areas of the country by treaty in the 1800s. The Quapaw Tribe was moved to northeast Oklahoma from their ancestral homelands in what is now Arkansas and eastern Oklahoma through a series of treaties in the 1800s. Lead and zinc were discovered on Quapaw tribal lands in the early 1900s. The Tar Creek site is part of the Tri-State Mining District, which comprises approximately 300 square miles in Missouri, Kansas, and Oklahoma. Oklahoma is the only state with tribal involvement in these sites. This site is now known as the Tar Creek Superfund site and is on the U.S. Environmental Protection Agency's National Priority List. The NE Oklahoma Superfund site is completely within the boundaries of the Quawpaw reservation.

The primary source of municipal water supply in Ottawa County, Oklahoma, is from wells completed within the Roubidoux Aquifer. This aquifer is dolomitic and relatively low in dissolved solids concentrations (less than 200 mg/L). The Boone Aquifer is primarily a limestone aquifer and is stratigraphically above the Roubidoux Aquifer. The Boone Formation also is the host rock for secondary mineralization (by sulfide minerals), which produced the metal ores that were mined in the Picher Field in northeast Ottawa County.

Lead and zinc mining occurred in the Picher Field from the early 1900s to the late 1960s. Mining peaked in Missouri around 1916, and then shifted to Kansas and Oklahoma where it finally ceased in the 1970s. Most of the lead used in the two World Wars came from this area. While no mining is currently conducted, at one time it was the largest lead mining operation in the world. Once mining ceased, water was allowed to enter the mine workings and eventually filled the mines to the point that water presently discharges from the mines at the surface in places. The mine water exhibits high concentrations of

calcium, magnesium, bicarbonate, sulfate, fluoride, cadmium, copper, iron, lead, manganese, nickel, and zinc.

Groundwater was pumped from mines until 1970 when mining ceased. This water was discharged into Spring River. As groundwater filled the mines, it became contaminated by exposed lead and zinc sulfide minerals and other sources of heavy metals. Due to the mines filling with water, and over-pumping of Roubidoux groundwater, there is now a downward (vertical) flow gradient from the Boone aquifer to the Roubidoux aquifer. This vertical gradient enhances the potential of contamination of the Roubidoux aquifer.

With the filling of the former mine workings in the Boone Formation, hydraulic head has increased in the Boone Aquifer; this has created the potential for a positive hydraulic gradient from the Boone Aquifer to the underlying Roubidoux Aquifer. This creates the potential for contamination of the Roubidoux with mine water. To examine this possibility, the Oklahoma Department of Environmental Quality has been monitoring several wells (including five municipal water supply wells and five recently constructed monitoring wells) in Ottawa County.

After Action Monitoring performed by State of Oklahoma (ODEQ) began in 1992 in the form of monitoring municipal water supply wells in the towns of Picher, Commerce, and Quapaw in 1992. These wells began showing elevated levels of iron, zinc, and sulfate, indicating they were being affected by mine water.

Results of this monitoring have indicated that all five of the municipal wells and at least two of the monitoring wells produce water with elevated iron, zinc, and sulfate concentrations. Water quality data from the mine water and some of the referenced Roubidoux wells was entered into the WATEVAL computer program. Piper Plots of this water quality data also were generated. Results indicate that samples from monitoring well “Picher 6MW” (the well thought to be most affected by mine water) is exhibiting strong evidence of mixing.

Water samples from the monitoring well “Quapaw 5MW” have been exhibiting elevated levels of iron, zinc, and sulfate; however, WATEVAL and Piper Plots indicated that the evidence of mixing in this well with the water sampled from the mine shafts in the main portion of the Picher Field is tenuous. This may be due to (among other factors) the proximity of the well “Quapaw 5MW” to the main portion of the Picher Field. More specifically, this well is upgradient from where the mine water was sampled, and therefore may be experiencing influence from the smaller mining operations just to the west of the city of Quapaw.

EPA assumed poor casings were the problem so they funded OEDQ to correct the problem. In 1997, ODEQ drilled and completed five monitoring wells in the Roubidoux Aquifer with state-of-the-art casing design to ensure no leakage through the well annulus. This was to address concerns about potential for mine water entering Roubidoux aquifer through poor well construction and/or natural fractures. The cement job was monitored carefully, inflatable packers were then added above stream to ensure that shallow water wouldn’t continue deeper into the aquifer. Five such wells were drilled.

Results of monitoring the newest wells indicate that at least two of the five show evidence of being affected by mine water (Picher #6MW and Quapaw #5MW. Evidence includes elevated levels of iron and sulfates. To investigate this further, additional analysis is required. Were monitored Roubidoux wells being affected by mine water? If so, was the mine water from the Boone formation reaching the Roubidoux zone due to poor casing seals, or from natural geologic conduits (i.e. fractures)? A technique was needed to investigate the possibility of mixing of mine water with clean Roubidoux aquifer.

It was necessary to compare the chemistry of ground water samples suspected to be affected by mine water with the chemistry of non-affected (clean) Roubidoux water and with mine water samples.

Piper diagrams were a viable technique. Piper diagrams are used in geochemistry and are a combination of cation and anion triangles that lie on a common baseline. If you plot more than one sample on the diagram you can tell if it comes from the same aquifer, for example. The balance of these things creates a unique signature. This tells you a lot about where that water came from so these are visual tools to help understand the origin of the groundwater.

Water quality data from the mine shaft, the Picher #6MW well, and the Commerce #5MW were plotted on a Piper diagram. In this sample piper diagrams indicate evidence of mixing if all of the following occur:

- 1) The analyses plot in a straight line in the cation and anion triangles;
- 2) The “mixture” plots between the two end members; and
- 3) The mixture exhibits the same proportions between end members in all regions of the Piper diagram (the “mixture” plots at the same position relative to the end members in all regions of the diagram).

The WATEVAL Computer Modeling Program has the capability of analyzing and quantifying the evidence for mixing among input water analyses. The program utilizes the water analysis data of the end members and calculates a predicted mixture. The predicted mixture is then compared statistically to the actual mixture and a correlation coefficient (R) is calculated to measure the level of agreement between actual and predicted mixture. A correlation coefficient of 0.9 (on a scale from 0 to 1) or higher, indicates strong evidence for mixing. Water quality data from a mine shaft, the Picher #6MW well, and the Commerce #5MW were entered into WATEVAL (aquifer input data also required). Results indicate that water from Picher #6MW well is a mixture of mine water and clean Roubidoux groundwater (R=0.92).

In conclusion, it is clear that refilling of mines and over-pumping of Roubidoux wells has created a downward (vertical) gradient of hydraulic head between upper aquifer (Boone formation) and lower aquifer (Roubidoux) thereby increasing the potential for mine water contaminant migration into municipal water supply.

Use of Piper diagrams and computer modeling provides strong evidence that mine water is impacting Roubidoux groundwater in newly drilled monitoring wells. The fact that mine water is affecting newly drilled monitoring wells with state-of-the-art casing design, indicates that contaminant migration is occurring through natural geologic pathways (i.e. fractures and leaky aquitard formations) rather than through conduits created by poor casing seals, probably on a regional scale.

Currently there are no primary drinking water standards for zinc or sulfates so there have been no violations of standards but this situation needs to be closely monitored. Collapses are a potential threat in a number of areas. Other problems exist where people are living right next to piles of mine waste. If towns are bought out, wells there can be shut down but the Tribe isn't helped by this...they aren't going anywhere.

Next Steps

- ODEQ will continue to monitor wells as part of the After Action Monitoring of OU1
- Data will be evaluated at the next five-year review to determine if action is needed (e.g., if primary drinking water standards are being consistently exceeded), and

- A federal buyout has been initiated of properties in danger of subsidence according to a recent U.S. Army Corps of Engineers study. Consequently, municipal water supply wells may be abandoned.

Questions and Answers

Q – What kind of remediation plans are in the works?

A -- Right now EPA is working on them, trying to stabilize things. There isn't enough money to completely remove all of the contaminated water.

Q -- Whose mines were/are these?

A -- Some started out as small mom and pop operations back in the late 1800's, then other companies got involved but most of them are gone now. A lot of them are bankrupt or part of other big companies. A lot of Quawpaw didn't want to sign mining rights agreements but unfortunately BIA stepped in and got people declared incompetent and signed mining agreements on their behalf. So, BIA is another responsible party.

Q -- Isn't there enough arsenic and lead or other contaminants in the water to require some kind of immediate response?

A -- Well, most of the wells were capped, but the site is so complicated that nothing has been done yet to address the problem to avoid future contamination or worsening.

Q -- Is the aquifer overdrafted?

A -- Yes, that is becoming a problem; they have to go deeper and deeper to get water from the aquifer.

Q -- What is the point in testing to determine whether or not there is mixing if nothing is being done to remediate?

A -- All these states are concerned about contamination getting deeper into the aquifer, this is the water source for the whole region, and there are no reservoirs. So you could use the technique to understand if the contamination is happening in other areas.

Q -- What impact do the collapsed mines have?

A -- One problem is that once an area is shut down, you can't live there, you can't farm there, so no one is there and you get animals coming in, and they can be contaminated as well.

Q -- Isn't there any money in Superfund?

A -- Not really, because it wasn't reauthorized there isn't really enough money to sustain it. There's nothing on the scale you need for this site.

Comment -- It sounds like the BIA is responsible for this whole situation and they should be held accountable.

A -- Well, the federal government wants PRP's to pay and they are pursuing the old mining companies but there hasn't been any decision on what responsibility BIA has. The Tribe is trying to work with them but it is slow going.

Q -- How many children in the areas have elevated lead levels?

A -- In the early 90's IHS did a test of elevated blood levels in Indian children; they found it was 35 percent at that time. EPA came in and did an emergency response, replacing yards. Of course, now people wonder why they spent all that money replacing yards that now they are buying out.

1 P.M., WATER AND COMMUNITY HEALTH

Facilitators:

Troy Pierce and Patti Tyler

Source Water Protection Planning in a Shallow Alluvial Aquifer

Dale Becker, Evergreen Rural Water of Washington, The Trading Structure Workgroup, Shelton, WA

Samuel Iwenofu, Quinault Indian Nation, Department of Environmental Protection, Taholah, WA

Taholah, the Quinault Tribal headquarters located on the Pacific Coast in Washington, installed new drinking water wells in 1995 with hookups for the community by 2000. New wells were needed because the community's spring water source was drying up, possibly due to timber harvest operations by industry in the area. Local leaders wanted to protect the new water supply. The Indian Health Service helped in identifying a radius of 300 feet around the wells as a no-impact zone. The well fields are about four miles east of Taholah near the Quinault River.

But the Quinault Tribe wanted more detailed planning and sought outside assistance (Becker). The primary goal of the resulting project was to identify risk and reduce it to protect the new alluvial aquifer water source. First, the area of concern was defined delineating all land uses and contamination sources, and then a risk management plan and emergency plan was developed for the area to be communicated to the public. There was also an emphasis on prioritizing limited resources to reduce risk.

Aquifers cover large areas. An even larger recharge area also must be identified. The EPA time of travel delineation was utilized to see how far water travels in five to 10 years, for example. A Step-Wise Delineation was used including initial modeling, analysis of how well the model captures the real world problem, analytical element modeling and data acquisition, with results indicating the final source water protection area.

Two types of models were analyzed. The Calculated Fixed Radius model using a steady state, homogenous site, and no recharge or aquifer gradient. This model was found to be unrealistic based on the landscape. The WhAEM 2000 model using heterogeneous aquifer changes over space, recharge, and a modeled gradient was found to be more realistic. A well log with the quantity of water that has been pumped can be used for analysis with this model.

The two wells are about 1,500 feet from the River in an alluvial valley floor with glacial till in the uplands. Water is drawn from about 50 to 60 feet below the ground surface. However, in the summer the water is about 16 feet below the ground surface and can be contaminated more easily. It was determined how far it takes water to travel in one year. A model is needed that uses the 100-foot per day information.

The sources of contamination in the watershed are the River, recreational pursuits, and forestry. These uses do not produce a high risk for public health, so the model is useful even though it's not perfect. In addition, it would be too costly to install monitoring wells in the watershed area. It was determined that risk could be managed using best management practices. The following options were proposed to the Quinault Business Council:

- Clean-up illegal dump sites in the watershed on the Reservation
- Use forestry best management practices and designate equipment fueling and maintenance areas
- Reduce equipment use
- Allow no forestry operations in the one-year time of travel zone

- Restrict fertilizer use
- Place a ban on forest harvests in the five-year time of travel zone, and
- Conduct public education about oil recycling and limiting herbicide use and littering.

Implementation of the BMPs depends upon endorsement by the Quinault Business Council. Then it will be determined how BMPs would be put into place.

Questions and Answers

Q – Does the Quinault Business Council have complete information to make decisions, like bio-chemical parameters for herbicides?

A – This project is not that detailed. It is simple risk assessment focusing on land use choices. Forestry is not considered a high risk activity.

Q – Forestry practice in the area seems to be clear cutting. Is there any impact from that on the water?

A – We have surface water impacts from harvest like temperature and soil erosion, but not for the groundwater or aquifers.

Q – If you sample the aquifers and get oil, can you identify the source?

A – This risk assessment model is used to prevent the problem. Where contamination has occurred, we can trace a plume to the source and can find oil if there is a large spill. But contamination from residential use is so small we can't detect it with our methods.

Q – What is the soil make up?

A – We would need to drill a lot of holes to find out. That is costly, and then the EPA Superfund would hold us responsible for remediation. For source water protection we would need a detailed business inventory to find those using chemicals. You can match chemicals to a point source, but it's more difficult for a non-point source.

Comment -- You could test the surface water before it enters the groundwater system.

A – We can't determine where the entire recharge area is located. Nature isn't as simple to understand as we would like.

Potential Contributions of the Burden of Disease and Injury to Assess Community Health in Indian Country

Catherine Michaud, Harvard University, Harvard Initiative for Global Health, Cambridge, MA

There are some key questions and indicators for human health assessment in the EPA Strategic Plan 2003-2008. Questions include: What are the trends in health status? What are the trends in human disease and condition for which environmental pollutants may be a risk factor, including across population sub-groups and geographic regions? Indicators for health status are mortality and life expectancy; for human disease and condition, incidence and prevalence; and for human exposure to environmental pollutants, measured blood levels.

Health is a top concern of Tribes. In preparing for the future, the Strategic Plan is focused on finding bridges and common interests among Tribes and on risk prevention rather than just mitigation. There is a multiplicity of risk factors and impacts over time that need to be considered, not just environmental risk factors. There also are mortality disparities that need to be understood.

For life expectancy, Michaud categorized the U.S. population into eight groups of “Americas” based on a number of socio-demographic and geographical variables. Results showed that Asians have the highest life expectancy, and Native Americans and high-risk urban Blacks have the lowest life expectancy, by a difference of more than 35 years. Another finding was that this gap has not improved much between 1982 and 2000.

The disparities in mortality are not explained by race, income, or basic health-care access and utilization alone or by a single cause of death, such as homicide or HIV. Mortality disparities are most concentrated in young and middle-aged males and females, resulting from a number of chronic diseases with well-established risk factors. Older people often seek and get more health interventions.

Policies aimed at reducing fundamental socioeconomic inequalities in access to health care are currently practically absent in the U.S. Health disparities will have to be at least partially addressed through public health strategies that reduce risk factors for chronic diseases and injuries.

A Disability Adjusted Life Year (DALY) is a metric developed to measure population health for the Global Burden of Disease Studies from 1990 to 2001 to identify the relative magnitude of diseases, injuries, and risk factors worldwide. It takes into account information on age specific mortality and the epidemiology of non-fatal health outcomes, information on the value attached to various health states relative to ideal health or death, and other social values. $DALYs = YLL$ (years of life lost to premature death) + YLD (years lost to disability from nonfatal conditions).

A 1996 Global Burden of Disease Study in the U.S. has several objectives:

- Incorporate nonfatal conditions in health assessments
- Develop a comprehensive set of internally consistent estimates for major health conditions
- Quantify intra-country differentials in health outcomes by age, gender, and race
- Place the U.S. public health situation in a global context.

Key findings of the study included the ten leading causes of death, which were ischemic heart disease, lung cancer, and cerebrovascular diseases with motor vehicle accidents ranking ninth after colon and breast cancers. For DALYs, top causes were ischemic heart disease, cerebrovascular diseases, and motor vehicle accidents with diabetes and osteoarthritis ranking eighth and ninth. Native Americans have a higher rate of injuries as compared to Blacks, Whites, or Asians.

Leading causes of DALYs by race are ischemic heart disease for Whites, HIV/AIDS for Blacks, unipolar major depression for Asians, and alcohol use and motor vehicle accidents for American Indians. The leading causes of YLL among American Indians are motor vehicle accidents for males and females followed by ischemic heart disease. The leading causes of YLD are alcohol use followed by unipolar major depression for both males and females.

DALYs can be used to target the effects of nonfatal health outcomes on overall population health, to compare the health of populations, monitor changes in the health of one population, and identify and quantify health inequalities within populations. They can be used to inform debates on health service delivery priorities, planning, and research and development and analyze the benefits of health interventions and cost-effectiveness.

The relative importance of risk factors as a fraction of the total impact or disease burden is critical in deciding the distribution of available and always scarce resources for interventions. A Comparative Risk Assessment (CRA) framework from 2001 provides a way to link the growing interest in the causal

determinants of health across a variety of disciplines. It also aims at mapping the alternative population health scenarios that arise from changes in the distribution of risk factors.

The CRA includes several environmental risks: unsafe water; sanitation and hygiene (diarrheal diseases); urban air pollution (trachea, bronchus and lung cancer, pulmonary disease, ischemic heart disease, stroke); and indoor smoke from household use of solid fuels (lower respiratory infections and chronic obstructive pulmonary disease).

In the U.S. the burden of disease is attributable to ten leading risk factors in rank order: smoking (13 percent), alcohol use (eight percent), overweight and obesity (7.5 percent); high blood pressure, high cholesterol, low fruit and vegetable intake, physical inactivity, illicit drug use, unsafe sex, and iron deficiency anemia (all under six percent each).

Some disease is due to combined or multiple risk factors. Multiple causes also means that a range of interventions can be used for disease prevention, with the specific choice determined by factors such as cost, available technology, and cultural preferences. A holistic approach is needed as well as detailed descriptions of the level and distribution of diseases and injuries.

A reliable and comparative analysis of risks to health and intervention cost-effectiveness is needed. A major challenge is obtaining the data for burden of disease analysis, including deaths registration, disease registers, epidemiological studies, health surveys, and health facility data. For risk factor analysis, the population attributable fraction of selected risk factors and combined hazards of multiple risks must be estimated.

Two major research challenges remain:

- Applying burden of disease analysis and the CRA framework to estimate the distribution and magnitude of major causes of disease burden for Native Americans and selected Tribes, and
- Systematic analysis of burden of disease to provide an evidence base to inform debates on health service delivery and planning priorities, research and development, and to analyze benefits of health interventions and cost benefit.

Questions and Answers

Comment – Alaska Natives may be a separate group because of their dietary issues and concerns.

A – The Native American category includes Alaskans in the others listing.

Q – Do county health departments provide data?

A – Census data were used for population. Deaths by cause was obtained from the National Center for Health Statistics. We need to explore what else is available to break data down for Alaska Natives. Possibly, local Tribes could keep track of data.

Q – In the ten greatest risk factors, high cholesterol was number four for heart and blood pressure disease. Are cancers related to high cholesterol?

A – The data doesn't yet look at those combined risk factors. It would be difficult to tell, for example, what fraction of each disease could be attributed to smoking.

Q – Is smoking a leading risk factor for death?

A – It could be because heart disease, for example, is affected by smoking over time, and more women are smoking now.

Q – Did you use data that compares different studies?

A – The data were updated in 2001. I recently published new material on how robust the data are on Native Americans throughout the U.S. Census data can vastly underestimate Native American health data. Since death is not reported as much in Native American populations, this could lead to an over-estimation of life expectancy in that group. The next step is to understand major risk factors in Native Americans.

1 P.M., TRAINING: Risk Assessment and EPA/Lifeline

Facilitator:

Elizabeth Resek

OPPTS Tribal Lifeline Project: Exposure and Risk Assessment Software for Tribal Communities and Other Unique Subpopulations

Dr. Christine Chaisson, Director, The LifeLine Group

Annie Blouin-Chaisson, M.P.H., R.D., The LifeLine Group

This training exercise began with an overview of the risk assessment process and its underlying principles as employed at EPA and other western-style health and regulatory agencies. Regulatory and public health agencies use exposure and risk assessment models to assess the potential exposure and risk that could be experienced by individuals in a community as a consequence of chemicals appearing in their diets and environments. Until recently, these assessments ignored individuals with unique exposure scenarios or diets, such as those found in tribal communities.

The training included a walk-through of the operation of the software and a discussion about what kinds of questions can and cannot be answered by the software. To illustrate the working of the software (Tribal LifeLine™ and other ancillary programs such as the Dietary Record Generator), an illustrative case study of a chemical that could be in traditional diets as well as in water and village environments was presented.

1 P.M., TRAINING: Data Management for Water Monitoring

Facilitator:

Elizabeth Wendt

Data Assessment/Analysis

Gretchen Watkins, Lac Du Flambeau Band of Lake Superior Chippewa Indians, Water Program, Tribal Natural Resources Department, Lac du Flambeau, WI

Jennifer Ousley, US EPA, Region 7, Kansas City, KS

Carol Russell, US EPA, Region 8, Tribal Water Quality Team, Denver, CO

This is the process through which monitoring results are evaluated to determine what they reveal about the condition of a water body. Presentation included a Tribal perspective and covered the basics of water chemistry and biological assessments including simple methods to assess data.

STORET INFORMATION (from Jennifer Ousley, R7): All CWA Section 106 grants starting on or after of Oct 1, 2006, must report all data collected using grant funds from EPA. The data should be reported in a STORET compatible format (such as MS Excel). EPA encourages tribes to transfer the data to STORET to add to our national picture of water quality. A STORET (an EPA water monitoring database) is not going away. It is changing names and the way that data is entered is being improved.

Individually hosted STORET copies will be phased out; therefore, no technical support for these hosts will be available in the near future for.

An internet based data entry tool call WebSIM will be coming later this year. In the mean time, a data template is available nationally to have data ready in the STORET compatible format. It is a guide to the required data elements for STORET/WQX (WQX is the Water Quality Exchange). The data template is an excel spreadsheet and can be found at <http://r5storet.com>. Training for this template will be available soon both online and on site at individual hosts. Once data is in this template format, it can be entered into STORET using WebSIM, when it becomes available. Technical Assistance is available now for those tribes already trying to enter data into STORET.

Data Assessment/Analysis – Tribal Group Exercise

The attendees participated in a group exercise that involved writing a water quality data assessment/analysis. Small groups reviewed watershed data, monitoring data, and other information to assess the water quality condition of the hypothetical watershed. As the attendees soon determined, there were some problems with the data that made it difficult, if not impossible, to do an adequate assessment. The exercise demonstrated that it can be difficult to assess the data and water quality without first having data quality and enough data. Data quality is the essential component of data management. Without the right amount, accurate numbers, and clear understanding of the data, an assessment can not be completed. The attendees determined that more monitoring and better data quality assurance was necessary to complete the assessment; the participants had accurate findings from the exercise.

3 P.M., Earth

Facilitators:

Marshall Cheung and Thomas Baugh

Invasive Species Impacts in Indian Country

Robin Powell, Pyramid Lake Paiute Tribe, Environmental Department, Nixon, NV

What is an Invasive Species? Any animal, plant, or other organism (including biological material of the animal, plant, or other organism that is capable of propagating the species) that is not native to the ecosystem and the introduction of which causes or is likely to cause economic harm, environmental harm, or harm to human health.

Economic losses in the United States due to invasive species are estimated at \$137 billion per year. Over 100 million acres in US are infested with invasive plants. Invasive plants constitute one of the most serious economic, social, and environmental threats of the 21st century. Many Tribes are focusing on the issue because of the negative impacts invasive plants are having on agriculture.

It is important to note that there is a difference between invasive vs. noxious plants. A “noxious weed” is any plant designated by a Federal, State, Tribal or county government as injurious to public health, agriculture, recreation, wildlife, or property. All noxious weeds are invasive. But what is a weed? A “weed” is a plant that is where it isn’t supposed to be or wanted. There are native, non-native, invasive, non-invasive weeds. The term “invasive weed” is used interchangeably with invasive plant because none of the invasive plants are wanted.

Invasive weeds are typically non-native plants, mostly of Eurasian origin. They arrived where they are now as a result of global movement due to human actions (especially in the last 70 years) such as travel, horticulture, and importation as environmental/ ecological remedies.

Invasive weeds are highly competitive, allelopathic, and usually result in monoculture development. As they are often imported without their natural predators they tend to be unchallenged in the system where they take up new residence. They are also highly adaptive and highly prolific with excellent seed dispersion, long seed viability, and extensive root development. Invasives are often rhizomatous with high meristematic cell growth.

The impacts of invasive plants on Tribal lands are profound. They affect local ecology, environment, culture, and economics. Invasive weeds can significantly alter the composition, function, and structure of an ecosystem. They cause negative impacts to T&E species -- more than 40 percent of listed species are declining due to non-native species as a result of loss of habitat, competition, loss of food source, and/or loss of ecosystem function. Invasives alter species diversity and abundance and cause a reduction of native plant community composition.

Ecological impacts include the degradation of habitat for animals; loss of nesting sites for waterfowl or migratory birds, and harmful effects on amphibians and fish are common. Purple Loosestrife, a plant of Eurasian origin, was brought into the US as a landscape plant. It is listed as a noxious weed in the lower 48 states and Alaska. It reduces habitat for waterfowl and amphibians and changes the functionality of wetlands. Beach Vitex is native to the Pacific Rim and was introduced in the US as a beach stabilizer. Unfortunately it is out-competing native vegetation and affects dune building, so it is not working as a stabilizer after all. It is also affecting sea turtles by changing habitat in ways that prevent turtles from getting to their nesting areas.

Environmental impacts of invasives include increase sedimentation into surface waters due to erosion -- such as is caused by perennial pepperweed -- and impacts to soil biology such as salt loading and the introduction of mycorrhizae fungi that helps invasive plants but kills others. Other environmental impacts affect water quantity and quality. Impacts to the riparian plant community lead to declines in properly functioning condition (PFC) and dissolved oxygen depletion.

An indirect environmental impact is increased pesticide use; herbicides and adjuvants are often necessary to control invasives. Any such use must conform to FIFRA requirements. Proper identification of pest and selection of pesticide are essential as is the idea of not trading one evil for another. Pesticides affect water and soil quality.

Finally, increased fire is another impact of invasive overgrowth. Tamarisk/Salt Cedar is of Eurasian origin and several species have been introduced. It is a phreatophyte (water seeker) which uptakes up to 200 gallons of water a day. This affects soil quality. The plant was introduced for soil erosion control and as an ornamental.

Eurasian watermilfoil is of Eurasian origin. This aquatic invasive affects fish habitat and the macroinvertebrate community because it prevents sunlight from filtering to macrophytes and it is an oxygen depleter. It was introduced accidentally and poses a real problem for fish survival.

Cultural impacts are of particular concern for Tribal people. Introduction of invasive plants can lead to the loss of medicinal plants and important cultural materials. A reduction in native plants used in a variety of traditional life ways and cultural practices causes a wide range of problems; impacts to funerary objects include pesticide contamination; alteration of the landscape of culturally significant and sacred sites can be devastating; there also is the threat of loss of traditional food sources and of potential pesticide contamination of non-target species impacts.

Some traditional medicinal plants and foods that are threatened include the following:

- Rosehips

- Spearmint
- Hopsage
- Penstemon
- Berries
- Fish
- Turtles
- Wild asparagus, and
- Honey – invasive plants many not be usable by local bees.

Impacts to cultural artifacts can be caused by the loss of feathers used in ceremonies if invasives overtake an area and waterfowl no longer use it. Yellow Starthistle causes many problems, including creating access problems for collection of traditional plants. This Middle Eastern plant was introduced accidentally through hay. It has achieved movement due to vehicles and soil disturbance. It has no forage value and lowers grazing value where it takes over. It is harmful to livestock health, lowers recreational value of land, and negatively affects the bee industry. Economic impacts of invasives are many and varied:

- Decreased land value
- Decreased forage potential
- Increased livestock illness or death
- Impacts to livelihood
- Loss of income
- Costs for control if not detected early enough
- PLS [spell out] costs \$45m annually due to loss of forage crops and control
- Health Issues (allergies), and
- Reduction in recreational opportunities and income.

Leafy Spurge is another problem; it reduces land value for livestock and emits a milky substance that can be toxic to livestock and affects human health as well. Many other invasive species affect tribes.

Invertebrates

Emerald Ash Borer: China

Ecological and cultural impacts due to reduction of Ash trees

Zebra Mussel: Europe

Economic impacts due to machinery breakdown

Environmental impacts due to changes in fish ecology and the food web,
bioaccumulation of pollutants, and changing of water clarity

Mammals

Norway Rat: Europe

Economic and public health issues

Nutria: South America

Ecological and environmental changes due to the destruction of wetlands

Beaver: North America

Ecological and environmental due to the creation of wetlands and increasing habitat for
other invasive weeds such as purple loosestrife

Reptiles & Amphibians

Brown Tree Snake: Asia

Bullfrog: Europe

Fungi

Soy Bean Rust: Asia

Microbes (Viruses)

West Nile Virus: Africa

Exotic Newcastle Disease: Asia

The list goes on and on. Management of invasive species is attempted in various ways. Integrated pest management (IPM) is the most effective tool in fighting the war on invasive species. But this is a long-term effort. It is very important to know the invasive species and its biology to effectively control or eradicate it. Management techniques can be categorized as follows: early detection and rapid response; chemical control; mechanical control; biological control; cultural control, and prevention.

Through early detection and rapid response it is possible to minimize the establishment and spread of new species through coordinated framework of public and private partners. Actions include detection and reporting, identification and vouchering, rapid assessments, planning, and rapid response.

Chemical control is accomplished through the use of herbicides and their adjuvants to control and/or eradicate. This usually leads to short term control but has drawbacks such as non-target species impacts. Regulatory issues (under CWA, CAA, SDWA, and FIFRA) must be adhered to when pesticides are used on federally held lands. Drift issues and T&E [define] concerns are another matter for consideration. Proper identification of the pest is essential as is the need to properly identify the appropriate pesticide to use against it.

Mechanical control consists of physical removal or prevention of the plant biomass by digging up, cutting, mowing, and grazing. This can raise soil and cultural site disturbance issues and while it is great for annuals, take care with perennials.

Biological control is the use of the native predators to suppress invasive species expansion. This method requires a long testing phase to determine non-target species effects and the APHIS permitting process is necessary. This method can lead to long term control in conjunction with other IPM tools and it is low cost.

Cultural control and prevention is affected through decontamination of equipment and livestock, reducing the transport of seeds, demanding weed-free hay and through the prevention of nursery sales of invasive plants.

Long-term management of invasive species is only successful if there is coordination with outside entities and stakeholders. Invasive species do not acknowledge boundaries. A wealth of expertise, emotional and technical support, and educational materials is available – but funding is another issue. Awareness and coordination are vitally necessary in winning the biological war with invasive species that will significantly affect Indian Country throughout the United States.

Next Steps

Tribal Invasive Species Committee Goals:

- Increase awareness
- Promotion of TISC
- Education
- Engage tribes and external stakeholders
- Provide technical support

- BMPs, management plan development and coordination with available expertise
- Improve funding
- Diversification
- Improve coordination, and
- Regional manager meetings and national workgroups.

Questions and Answers

Comment -- Thanks Robin, that was really good. Here we have a species you didn't mention, Japanese knotweed that really affects salmon.

Comment -- Tulah Tribe's been working on environmental diversity for awhile, we have worked on an internal definition that includes the cultural impacts. We hope the feds will come up with something on the cultural impacts, guidelines. Is there a standard duty of care for property owners in controlling invasive species on their property? We need some regimen of care. Also, you need to look carefully at your local area and decide what works. In this area, for instance, we're trying to bring back beavers; the loss of them is a huge impact on the water system. And finally on the issue of bees, it isn't just about honey production but pollination overall.

A -- There is the federal interagency working group, and we are working on getting standardized language. Yes, the beaver is a good example, in my area it is highly invasive, so it's true that you have to consider carefully what works for your area.

Mercury Contamination of Cheyenne River Sioux Land

David Nelson, Tribal Science Council (TSC) Tribal Co-Chair, Director, Environmental Protection Department, Cheyenne Rive Sioux Tribe, Eagle Butte, SD

Mr. Nelson gave a talk explaining steps being taken to deal with mercury contamination in the waterways in his community. His remarks are summarized below.

We had a project that stemmed from a Superfund site that involved gold mining operations over about 100 years. What we looked at initially was that we got on the project with EPA and some others; we went to court with Homestake Gold Mine, suing them and settling out of court for about \$1.8 million, and 400 acres of land in Wyoming, as well as some other concessions that will allow us to continue doing some monitoring.

The first thing we looked at was assessing health impacts and ecological conditions on the reservation as result of the mining. The EPA Superfund people wanted to know, why do you want to know, it's not on your reservation? But we started sampling. Region 8 EPA worked with us as well as the US Fish and Wildlife Service to examine the fisheries aspect. The Cheyenne River has been affected by mining and agriculture and we wanted to look at the overall ecological status of that river system.

We started when our reservoir was at its fullest, and we started with testing fish and water sampling. Then EPA asked for background data. The next year Cheyenne River found elevated levels of mercury in fish, almost as high as in the Cheyenne river. Fish in both areas were exceeding acceptable mercury levels, so our background concentrations were almost as high as those in our "problem" areas.

We found we were getting a lot of mercury deposition. This could be from China and Europe, because of the jet stream. Once we realized how high the levels were we realized we had to tell the people. We had to put out an advisory first on the Cheyenne River, then on all the waterways. Suddenly we started

getting lots of calls with questions – why shouldn't we eat the fish? People brought in fish that were covered with sores and wanted to know what was wrong with them.

Title V came into play, a settlement regarding mismanagement by the Army Corps of Engineers that leads to constant flooding of the reservoir. We also wanted to test the sediment around the river because every time you flood the reservation you're moving the sediment further out. We tested a ten mile section of the river – the Corp found so many levels of contamination at so many depths that it was clear they were moving the contaminated soil and sediment onto our lands. At this point we wanted to know how it would be fixed. The reservoir is at an all time low now and it is causing problems with the drinking water.

We are currently working with the Army Corps of Engineers to locate our water intake downstream, but the problem is still there and if they raise the river level again, they will push the sediment back out.

So we still had the problem on how to inform the people. We were working with EPA and trying to come up with a long-term monitoring program for mercury. If we are getting this, other reservations are probably getting it too. An NIEHS grant allowed us to start a survey to show the habits of the people, consumption of fish, health impacts based on daily diet, how much they use the river system, and how often they swim in the river. We are doing radio announcements saying not to eat fish, and sharing the guidelines for how much fish can be eaten. But you still have people who eat catfish every other day.

Next Steps

We don't know how long this is going to take. We would like a program to track the problems beyond my life and my kids' life. You have to consider over a hundred years of mining, and not just from Homestake, but all around, lead, copper, uranium, gold. We have hundreds of years and tons of sediment all along that river.

Questions and Answers

Q -- Has the Corps done anything about removing the sediments? I know they've done some work with PCBs in the east.

A -- They were talking about dredging but we said no. We don't want to resuspend the contaminants and have it affect our new intake.

Q -- Do you know what effect there has been on people eating the fish?

A -- Hopefully we'll learn from the survey. We want to look at their diet. If we find that people are eating fish from the river system three, four times a week, we might go out and do another phase, do some blood work.

Q -- Are you working on a specific mercury rule for the tribe?

A -- We are counting on the EPA right now, until we have the money, but we won't adopt the state standards.

Comment -- Navajo Nation rejected the EPA standards and we are working on our own.

A -- Well, when you're financially challenged you can't fight every battle.

Q -- Do you have any problems with acid mine drainage? Are you dealing with that if the river bed dries and then remobilizes the contaminants?

A -- We haven't seen a lot of that, probably because upriver they've dredged and seem to have cleaned it up pretty well. But there are other mines that we're still working with EPA on, trying to keep them from leaching. We haven't seen it yet.

Comment -- In Navajo we are getting a lot of help from MIT and Harvard and Stanford. You might want to get in touch with them.

A -- We did discuss that, but at this point because of legal issues we can't do that now. I can't really discuss that.

Impacts of Climate Change and Land Use in the Southwestern United States

Margaret Hiza-Redsteer, USGS, Earth Surface Processes, Flagstaff, AZ

Native Americans of the Navajo Nation are the fastest growing reservation population in the United States, with one-half of the residents below the age of 23 (U.S. Census, 2000). They live in an ecologically sensitive arid to semi-arid region with limited resources. Here, as on other Native lands, traditional people live a subsistence lifestyle that is closely tied to, and dependent on, landscape conditions.

Global change, with regard to climate, includes significant changes in long-term average temperature and precipitation. Many studies have shown that in the past couple of decades, average temperatures have risen (compared to historic averages) in many parts of the world, including the southwestern United States. This past decade, the southwestern United States, including the Navajo Nation, has also been experiencing a major drought. Global warming may already be contributing to drought severity on the Navajo Nation. The dual effects of increased temperatures and decreased precipitation are likely to have profound effects (both geologic and biologic) on the semiarid landscape that includes southwestern tribal lands.

For the region of the Navajo Nation, the amount of effective precipitation, the moisture not lost to evaporation, decreases by approximately 2" for every 1 °C increase in temperature. Annual rainfall in many parts of the Western Navajo Nation averages between 5 and 7 inches in "normal" years, but has been as low as 1 to 2 inches in many areas during recent drought years. In addition, average annual snowfall for the Navajo Nation has decreased significantly since the early part of the 20th century.

Our work has found that some land use practices, such as importing weedy hay during periods of drought, and off-highway vehicle use, are compounding the sobering effects of drought and climate change to mobilize surface sediment and degrade rangeland. Sand dunes that cover approximately two-thirds of the Navajo Nation have become active to partly active in many areas in recent years.

We are working on a rather small project on bedrock mapping, gathering information for land use planning and urban development. I have only 3 USGS staff. But I have a lot of students working on this project and many of them are residents of Navajo. The objectives and strategies of the project are to examine the structural stability of housing foundations, look at the environmental impacts of landfills and septic systems, examine hydrologic resources, and determine landscape stability and surface erosion.

Bedrock is affected by changes when things are out of balance. You see impacts. Each ecosystem reacts differently to climate change and I think it's important to strategize through effective land use and planning. This is not just an environmental justice issue.

We are working with a very large area, covering parts of three states about the size of West Virginia. It is also a varied landscape. Navajo is divided into chapters. We've had a ten year drought. Lots of other

tribal lands in the Colorado plateau are affected. To get information for land use planning and urban development we did surficial mapping, looking for geological hazards and landscape changes in response to land use and climate change. We are also looking at drought mitigation and issues affecting surface erosion and vegetation.

Looking at spring environments, we saw that the springs that were most reliable are the ones in Navajo oral history, the ones mentioned in lots of stories and songs. Comparing old maps with current topographical ones we can see that in less than 20 years the channel location of the Little Colorado River has moved more than a mile. We suspect that changes in streamflow dynamics cause the river to change. Sediment accumulates and causes the channel to move. Streamflow may also be caused by the effect of wind blowing sediment.

We are looking at the impact of roads and off-road vehicle use to determine changes in surface run-off and ranch land management. Raising awareness is important; suppressing off-road vehicle use is one way to address severe run-off events. Comparing old photographs from early in the 20th century to current sites we can see changes as well – we see a lot of land surface change.

Impacts of climate change include monsoons coming later and later. High intensity rain events come in September instead of rainstorms in July. Snowfall is decreasing, our overall data show. Snowfall is like having water in the bank. For example, Denver relies on snowmelt to address their water needs. They have no idea how they will meet the need for water if they cannot count on snowmelt in the spring.

Two-thirds of Navajo is covered with sand dunes. Dunes are very sensitive. Looking at changes in the types of dunes and how active they are also shows some of the devastating impacts of climate change. We are seeing increasingly mobile dunes – sand dunes with high mobility are unstable, vegetation free and move with the prevailing winds. With long-term drought infiltration rates change. We need to redefine how we think about drought and compare what is happening in different areas. Dune mobility leads to destabilization of the land which affects land use. It also creates an environment friendly to invasive species, such as *Salsola* which travels into the area hidden in hay and takes root in disturbed areas. Changes in the sand also lead to changes in sediment availability. All of these factors are working together to create some very inhospitable landscapes.

Questions and Answers

Comment -- I was wondering, at Taholah tribe we've been doing some land use modeling. Have you done anything on the cost of delay or cost of inaction? If you have some plan, can you run a model to determine what the costs of delay are if you wait ten years, or twenty years? In this region our winter is two months shorter, causing changes in water and salmon habitat. And it looks like we've already lost 1/3 of our infiltration in this region. But we believe that with different land use we can actually affect wind. We think that the cost of delay is too high -- the window of opportunity to deal with climate change is just going to close. Also, I think it's great working with students, but as we get into issues of culture and tradition we need to be careful about the legal framework around knowledge.

A -- Actually, I'm part of the tribal climate working group and this is one of the issues that we have discussed at length. Tribes are going to have to be more open with one another; there have to be ways to talk about these issues so that we don't give away the information, say the name of a specific plant, you could just talk about medicinal plants, but we have to find a way to talk about it and share information at this point. As for putting a dollar amount on the cost of delay, I don't think you can do that. I think the situation is too far gone for that. I know that native people really care about their homes, they don't want

to leave them and they are going to do everything they can to improve things and they need the information to do that.

3 P.M., WATER AND COMMUNITY HEALTH

Facilitators:

Troy Pierce and Patti Tyler

Relationship Between In-Home Water Service and Acute Respiratory Infections Among Alaska Natives

Troy Ritter, Senior Environmental Health Consultant, Alaska Native Tribal Health Consortium
Jeff Smith, Environmental Department, Alaska Native Tribal Health Consortium, Division of Environmental Health and Engineering, Anchorage, AK

The primary question addressed by this research is whether sanitary facilities (water and sewer) connected to homes have improved the health of Native Americans. There have been about 200 studies globally related to this question since the mid-1950s. Partners in this study included the Denali Commission and numerous other Native American health organizations.

There is still only basic water and sewer service in about 34 percent of Alaskan villages. Some areas are too swampy to build in-home sanitary facilities. Portable toilets are placed in homes and children often are in charge of dumping the containers at a waste site. The containers freeze in the winter, and waste material is hauled away. Overall, only about two percent of homes in the U.S. do not have piped, running water, and sanitary facilities.

For drinking water, many Alaska Natives have to catch rainwater in a container or break ice chunks out of ponds in the winter. In towns, there is usually a central water supply where containers can be filled and brought home. There are some new facilities being built in some parts of central Alaska.

A recent study compared disease rates statewide and regionally with the availability of in-home water and sanitary services. Data on in-home service came from the Rural Alaska Housing Sanitation Inventory and from personal interviews with residents. Disease data were collected from the Indian Health Service hospital discharge records. CDC illness classifications and outbreak information for gastroenteritis, pneumonia, influenza and other soft-tissue infections were also used.

In looking at hospitalization rates in both high and low water service regions in the state, the data showed that for diarrhea cases there was no difference in disease incidence. But there was a large difference in the incidence rate for pneumonia and respiratory infections, with more cases in areas without in-home water and sanitary services, and a moderate difference in skin infections.

Analysis of data for children under age three living in the Yukon between 1999 and 2004 showed that low service communities had pneumonia cases 11 times higher than the U.S. average. Respiratory infections and pneumonia cases recorded were also very high. These diseases are a major cause of death worldwide. For skin infections and hospitalizations, there was a higher disease rate with lower service in the home.

Among conclusions reached in the study regarding respiratory infections, it is clear that having ready access to water encourages increased consumption of water for drinking, hand washing, and sanitation purposes, thus limiting disease. Communities that have piped in water use 24 gallons/day/person versus two gallons/day/person where there are no services. In-home practices are poor where there is no in-home service. For example, all the people in the house will wash their hands all day long in one bowl of water.

Regarding diarrhea rates, study researchers looked at White and Bradley's 1972 classification system of water-borne disease and disease caused by an inadequate quantity of water. Diarrhea is water-borne, and it is contracted mainly from drinking contaminated water. Other data showed that where there are potable water sources within 30 miles of a home in Alaska, Natives are already benefiting from this service in the form of lower disease rates.

Next Steps

- Continue to provide sanitation infrastructure to deliver convenient access to an adequate quantity of water
- Do more research on the variety of uses for water among Native Alaskans
- Recognize respiratory infections as an indicator of sanitation conditions
- Mobilize and utilize the assets of the environmental health program to assist with a respiratory epidemic and to educate people about health
- Improve the ability to collect comprehensive disease statistics
- Do follow-up studies on the burden of disease and the cost to the health system and the family, and
- Use two randomly selected groups in an ideal experiment design.

Questions and Answers

Q – Are there concerns about indoor air quality, such as molds, for respiratory infections?

A – Housing is poor. Southeast Alaska has more rain and molds, but had the lowest disease burden. There is permafrost there, so most houses are built on stilts. Molds can't easily migrate into homes.

Q – Is there a public education program?

A – An education program is just starting, and will stress hand washing.

Q – Is there education work being done with Tribes directly and their health providers or clinics?

A – Because the focus is statewide service, consultation is provided directly to health services, not residents.

Comment – Local schools do educate children on hand washing.

Improved Water Quality and Community Health in the Border Indigenous Communities of Baja, California

Hiram Sarabia, University of California at San Diego, Superfund Basic Research Program, Research Translation Core, La Jolla, CA

Paula Stigler, Pala Band of Mission Indians, Tribal EPA Region 9, Pesticide Program, Pala, CA

There are indigenous communities in the northern Baja Peninsula of Mexico. There are also several indigenous communities near the Baja/California border, including the Kumiai and Cucapa peoples, and the Paipai within 100 km. All are directly related to Tribes in the U.S. Some continue to inhabit ancestral territory that was divided by the US-Mexican border.

In Mexico, indigenous people are not considered sovereign nations, but are recognized as a special needs group. All tribal communities have their own government that may include both traditional and elected

authorities. Most Tribes hold regular meetings (asambleas) to discuss issues and make decisions. There are regional or Intertribal Councils at the state level, which have greatly increased native political power.

Environmental issues include a lack of infrastructure for drinking water sources. Most communities use hand-dug wells or spring boxes. There are operation and maintenance concerns, and the water is of poor quality and quantity. Non-point source pollution and source water protection are also major issues.

Regarding infrastructure with the old pump water system, typically a reservoir leads to a sand filter and a solar pumping station which doesn't always work. Pipes may run through a cemetery because the government didn't work with the local community, and pipes often leak, reducing water pressure. Hand-dug wells are not covered, so contamination occurs, including with animals such as frogs and worms, leading to a higher rate of gastrointestinal illness compared to the Mexican population overall. Some wells are simply abandoned. Water storage and transportation are often not handled in the most sanitary manner.

Regarding non-point source pollution, solid waste dumps are open to the environment, and streams are contaminated by latrines where there are no septic systems. Without adequate infrastructure, wastewater management is a major concern along with operation and maintenance of current systems.

From 1996-1998, in the initial assessment phase of the study, Mike Wilken and the Campo Tribe conducted a wetlands restoration project in San Jose de la Zorra. They found the drinking water in some indigenous communities to be contaminated with fecal coliform bacteria. Drinking water samples were taken in four communities using the JA JAN Coalition-Laboratory Network, the EPA/Mexican standard, indicator bacteria *E. coli*/Total Coliform, the IDEXX System (Standard Method), and data reports were generated.

For monitoring on April 16-17, 2005, using health risk levels established by the World Health Organization (WHO) for drinking water contaminated with *E. coli*, high risk levels were found for the Kiliwas Faustinos storage drum (54-hour hold time) and Kiliwas Reservoir (53-hour hold time).

Samples were taken in four border communities, San Antonio Necua (community 1), Santa Catarina (community 2), San Jose de la Zorra (community 3) and La Huerta (community 4), from various sources of water – spring/creek, well, reservoir/storage tank, transporting container, storage drum, house container, and water tap in the front yard. The highest numbers of *E. coli* were found at the source, in streams or springs and wells and in storage drums or containers. One community had a high level from a tap source.

Next, an environmental health survey and sanitary survey was conducted in the same communities. An initial survey was followed by another one every two weeks over four months. Survey instruments were used by community *promotoras*. The survey was designed in collaboration with the community doctor, health agencies, and education faculty. The main source of water for families in communities 2 and 4 was a community fountain. For community 1 the source was a spring and for community 3 a well. The most commonly used containers to collect water were buckets, 5-gallon jugs and gravity piping.

All stored their water in a bucket or a large drum. All containers were covered and placed onto furniture off the ground. About one-third of respondents had disinfected the water in the past two weeks in community 1. Between 80.9 and 93.2 percent had not disinfected water in the other three communities. However, it was difficult to correlate incidence of disease (diarrhea, fever) with water quality.

Site inspections and assessment of water systems were conducted next in seven indigenous communities with \$36,000 provided by EPA. The Pala Band of Mission Indians sponsored the project. U.S. and Mexican nonprofit groups conducted the assessment (Aqualink, CUNA, JA JAN Coalition).

Recommendations for improvements to the water systems were ranked based on *E. coli* results. San Jose de La Zorra (where there were many children), Kiliwas, and Neji received the highest rankings followed by San Antonio Necua, Satan Catarina, and La Huerta. No risk was found in Cucapa where the Colorado River water is filtered. But the community does not like the taste of the water. Improvements were estimated at \$619,599 for a total combined population of 1,233 individuals.

New water systems are being installed with about \$900,000 from the Mexican government and with supplemental money from EPA through the Pala Band. At San Jose de la Zorra, Mexico committed \$236,238 and the U.S. \$33,000 to construct a new well, water storage tank and distribution system. At San Antonio Necua, Mexico committed \$235,509 to do the same work and the U.S. provided \$33,000.

For maintenance and operation, \$56,000 in Border 2012 funds were used. For community capacity building, groundwater source protection training was provided along with operation and maintenance training for new systems. The systems must be low-tech to make them cost-effective for communities.

Next Steps

- Obtain pending funding from Pan American Health Organization
- Show a causal association between improved access to potable water and improved health among community members in Necua and San Jose de la Zorra
- Design health surveys and drinking water quality samples to be administered once per month
- Take two virus samples, and
- Compare the results to previous study findings.

A community-based approach is recommended for local population buy-in to improve drinking water practices and continual communication. Tribal needs-oriented projects are necessary along with Tribal representation in design and administration. Projects must build in Tribal sustainability, and project reports should be made directly to the community.

The study showed also that Tribal health concerns must be addressed on both sides of the border in a community-based and multi-disciplinary approach. There is a lack of understanding of cross-border Tribal relationships. These aren't just bi-national, but tri-national issues, and Tribal sovereignty must be honored.

For more information or to make suggestions, contact Paula Stigler at pstigler@palatribe.com or Hiram Sarabia at hsarabia@ucsd.edu.

Questions and Answers

Q – Did you consult with the communities to put in new facilities and for water usage?

A – The communities don't want chlorination or disinfection, so wells are drilled deeply enough that there isn't contamination.

Q – How many Tribes north of the border are involved?

A – Two or three Tribes in the US and five to seven communities on the Mexican side.

3 P.M.. TRAINING: RISK ASSESSMENT AND EPA/LIFELINE

Facilitator:

Elizabeth Resek

OPPTS Tribal Lifeline Project: Exposure and Risk Assessment Software for Tribal Communities and Other Unique Subpopulations (continued)

Anne Marie Chaisson, The LifeLine Group, Durham, NC

Christine F. Chaisson, The LifeLine Group, Annandale, VA

This Tribal risk assessment training session was focused on case studies presented by the tribes. The training allowed for audience interaction, tailored for the tribes, and included tribal examples.

An estimated 25 participants attended the session. Although the knowledge base of the attendees varied greatly, even those with less technical seemed interested and stayed for most or all of the session. Comments from those attending the Tribal LifeLine Session expressed concerns about the need to return to the communities and the need for acceptance from communities. Several attendees commented that there is a need to use existing data or surveys from/of traditional foods, plants, etc. and one said, “I don’t want Alaska to be a target for studying. We have been studied long enough and that makes me angry.”

Aspects of the course identified as particularly good or strong included the following:

- Making the connection to tribal needs
- Seeing examples of risk assessment being used, and
- The session wasn’t too technical (“not too much science”).

Two concerns also were noted:

- Potential use needs to be developed, particularly with regards to tribal codes and legislative changes, and
- Different regulatory interpretation (how risk assessment varies across EPA) is a concern.

When asked how they would make use of course information in their tribal communities, attendees said they would make reference to methods that can be used to promote change and discuss use of this model with risk assessment professionals.

3 P.M.. TRAINING: DATA MANAGEMENT FOR WATER MONITORING

Facilitator:

Elizabeth Wendt

Data Reporting/Exercise

Eric Wilson, US EPA, Region 9, Office of Water, San Francisco, CA

The new reporting requirements under CWA Section 106 grants will help tribes to collect critical data and information for effective management of their water quality programs as well gather consistent data for EPA to use to determine trends in water quality across the nation. The new report that tribes are required to submit will include: a description of the tribe’s monitoring strategy, list of tribal waters, interpretation of the data, and monitoring data results. EPA’s assessment report requirements were covered in detail.

Recording monitoring data and reporting these data to EPA is important. It was emphasized that this does not have to be complicated or a burden. A few protocols are required, for example, analyte names must

match those used by EPA. Several free tools are available to assist, in particular the Tribal Template developed by EPA Regions 5 and 8, and the WebSIM web based data migration program.

Evening Event

Reception Sponsored by Northwest Indian College

An Introduction to the College and Discussion

Facilitator:

Dan Burns

Located on the Lummi Indian Reservation in Washington State, 20 miles from the Canadian border, Northwest Indian College (NWIC) is the only accredited tribal college in the states of Washington, Oregon, and Idaho. NWIC grew from the Lummi Indian School of Aquaculture (founded in 1973), a single-purpose institution developed to provide a supply of technicians for employment in Indian-owned-and-operated fish and shellfish hatcheries throughout the United States and Canada. In 1983 the Lummi Indian Business Council recognized the need for a more comprehensive postsecondary institution for tribal members, and the school was chartered as Lummi Community College, an Indian-controlled, comprehensive two-year college designed to serve the postsecondary educational needs of Indian people living in the Pacific Northwest. In June of 1988, Lummi Community College was approved as a candidate for accreditation by the Northwest Association of Schools and Colleges (NWASC), and on January 20, 1989, in acknowledgement of its wider mandate, Lummi Community College became Northwest Indian College.

The educational philosophy of Northwest Indian College is based upon the belief that the opportunity of post-secondary education must be provided within the Native American community. Northwest Indian College is committed to the belief that self-awareness is the foundation necessary to achieve confidence, self-esteem, and a true sense of pride; to build a career; to create a self-sufficient life-style; and to promote life-long learning. It is also committed to the belief that a self-awareness program must include a study of Native American culture, values and history.

Northwest Indian College (NWIC) introduced the development of its Bachelors degree in environmental science and sought input from those in attendance on program goals, structure, and content. There were approximately 60 attendees, mainly Native environmental personnel from tribes and the federal government and Native graduate students. NWIC will be applying for approval to implement the degree program beginning September 2007. Below is a list of questions and comments that were discussed.

- How will the program accommodate the fact that NWIC will have students from various Tribes with diverse cultural backgrounds and traditions while at the same time existing on the Lummi Nation? How would this effect the tribal communities of the students, would they want to return to their homeland after graduation or would they not return, contributing to the “brain drain” of the various Indian Nations?
- What about Distance Learning to remote sites?
- What about scholarships for students?
- What are our local historic environments and how can the program serve them? The program should be designed to learn about those environments that help to define the various cultures and traditional ways.
- The program should try to work with existing networks and Universities such as the Traditionally Black Colleges and Universities for input. How have the HBCU’s evolved?
- The “Native World View” should be brought back and acknowledged.
- The students need role models and natives to look up to. What about Native faculty?

- The program needs to incorporate culture, language, customs, etc. Keep regional identity and incorporate what you have (Salmon etc.).
- There needs to be a research/thesis component for science students with a cultural component for benefit of Indian Nations.
- A question-based curriculum would be good. Western and Native ways need to be used.
- We need to prepare students to think holistically and think critically.
- The program must be scientifically rigorous and defensible with a core foundation in “good” science, while at the same time remaining true to the traditional ways and needs of the Indian Nations. The inherent thinking that TCU’s do not produce science of the same rigor and defensibility as the main stream Universities and Colleges may be a challenge for accreditation and funding.
- The program should be well rounded, incorporating Environmental Studies and Justice, as well as Federal Indian Law. The students will need the knowledge of the various laws, regulations and agencies that work with Indian Nations on Environmental issues, as well as the skills to effectively work with them (communication, reading, writing, research skills, etc.).
- The program must also build relationships with various organizations and agencies to offer good networking and internship opportunities to the students. This is also essential to show the students the type of jobs that are available for them after graduation.

For more information on the program and to provide input contact Dan Burns (dburns@nwc.edu) or Ted Williams (twilliams@nwc.edu).

Wednesday, September 27, 2006

8 A.M., AIR

Facilitators:

David LaRoche and Michele Dineyazhe

Where Does the Dust Come From? An Analysis of Days with the Highest Particulate Concentrations on the Bishop Paiute Reservation, 2003-2006

Toni Richards, Environmental Management Office, Bishop Paiute Tribe, Bishop, CA

The Bishop Paiute Tribe is located on the California/Nevada Border in the deepest valley at 4,000 feet between the Sierra Nevada and White Mountains. It is about 200 miles south of Reno, Nevada, 270 miles east of Las Vegas and 300 miles north of Los Angeles. The Reservation is just 60 miles north of the Owens Dry Lake in California, the largest source of PM-10 in the nation. Thousands of tons of dust are released into the atmosphere each year.

Wind and soil disturbance causes dust. The Owens Dry Lake was once a lake with water in it, but it was drained in the early 20th Century when an aqueduct was built to transport water to the City of Los Angeles. When the alkali soils on the lakebed are exposed to moisture, the surface is very susceptible to wind erosion. Winds pick up sand, which in turn stirs up smaller particles, creating airborne dust.

The Tribe is trying to determine whether dust episodes on the Dry Lake affect the Bishop Paiute Reservation and whether conditions have changed since the implementation of controls. High dust days are measured by PM-10. The study started with days having at least one hour over 100 micrograms/m³, but there were too many such days to define the study.

Then days were selected to analyze for at least one hour over 200 micrograms/m³. All days that exceed the CA and Bishop Tribal 24-hour standard, 50 micrograms/m³, have at least one hour over 200 micrograms/m³. Other significant dust episodes have hourly concentrations in this range. There were 35 days with at least one hour with a concentration over 200 micrograms/m³. The data are spread between 2003 and 2006 with 10 days in 2003, 14 days in 2004, 10 days in 2005, and 3 days in 2006 (one-half year recorded).

October 2004 had the highest PM concentration days. The maximum hourly concentration was 1,200 micrograms/m³ with typical wind gusts between 30 and 40 mph from the southeast, mostly involving frontal passage episodes. The data are compared to the PM-10 data standard and come from several sampling sites, including air quality programs of the Bishop Paiute Tribe, the Lone Pine Paiute Shoshone Reservation, and the Ft. Independence Reservation. The most critical site was the Great Basin Unified Air Pollution Control District, which handles mitigation efforts on the Dry Lake.

Analysis methods from 2003 forward included graphs, maps of activity on the Dry Lake, and modeling of back-trajectories with HYSPLIT. From 2005 forward pollution wind roses were created and visibility information was collected via photos of a fixed location. An episode is composed of a multi-day event. The analysis was completed for every day with at least one hour with a concentration over 200 micrograms/m³.

Over a five-day episode, April 9-13, 2003, a series of wind peaks was recorded from the southeast with evidence of a frontal passage. There were high concentrations at Lone Pine Reservation on all days and activity on the Dry Lake only two days. HYSPLIT was of limited value for these readings. Researchers expected the Lone Pine site to get higher concentrations than the Bishop Paiute site if the dust was coming from the Dry Lake, but this didn't happen. Over a five-day episode, March 29-April 2, 2004, a reversal was experienced with winds from the southwest hitting Bishop before Lone Pine. There appears to be a Dry Lake rerun when the wind changes. HYSPLIT performs well with reversals.

On October 14-15, 2005, wind and pollution roses and the back-trajectory showed that wind was from the southeast and then from the north. The local wind changes just before highest concentrations are recorded. At Dry Lake, the highest concentrations were at the south end of the Lake. Data showed that wind direction varied with an interesting reversal.

There was good agreement of wind gust information with pollution/wind rose and no high concentrations from Lone Pine. Visibility information is strongly affected by weather (water vapor), but is useful for identifying storms. HYSPLIT is in general agreement with other wind information. Activity on Dry Lake and around the Lake and high concentrations at Ft. Independence were noted for one day only.

Generally, it is a problem to understand the data due to the variety of episodes, especially when there is no activity on Dry Lake and high concentrations are recorded at the target sites. More research is needed on other potential source locations. However, the high PM-10 days can be separated into those where the Dry Lake probably had an impact and those where it probably did not.

Forty-nine percent of high dust days also have high activity on the Dry Lake. Forty-six percent of high dust days are also high dust days for the Lone Pine Reservation. Thirty-three percent of high dust days are also high dust days for the Ft. Independence Reservation. Nearly half the time there is evidence of activity on the Dry Lake when the Bishop Reservation has high PM-10 concentrations.

Have there been changes over time? Mitigation has proceeded with state implementation beginning in 1998 over about 40 square miles by 2003. Another 30 miles was mitigated since 2003, and 30 acres have

shallow flooding or managed vegetation (salt grass) to limit dust. However, the weather has not been consistent over time.

Conclusions are that Dry Lake affects the Bishop Paiute Reservation but also other sources may be affecting the site. Construction confounded sites where mitigation might have been working. There is not enough data for firm conclusions about trends. There is also too much variability in the weather to draw firm conclusions. Even in drier years there was not always more dust because at least some moisture is needed to fluff the soil and allow it to be picked up by the wind.

Litigation over violation of the standards will be on-going to seek additional controls. There may be a policy shift to eliminate the federal PM-10 standard for rural areas. However, the CA standard would still apply (50 micrograms/m³). The Bishop Paiute Tribe has adopted its own PM standards, the same as the CA standard. There is little enforcement action.

For more information, contact Toni Richards at trichards@bishoptribeemo.com or www.bishoptribeemo.com.

Questions and Answers

Q – Are there any correlations with health effects on high PM days?

A – Only anecdotal evidence. People at Lone Pine complain of respiratory problems. We would like to correlate local health clinic emissions with high dust days.

Q – What is the composition of the dust?

A – The dust is high in cadmium and selenium, but not tungsten. There is erosion of the Sierra Nevada and White Mountains in the valley, too. For 25 years the District has tried to identify chemical composition but there is no defined chemical signature.

Q – Is mitigation with grass the only method tried?

A – Shallow flooding is used along with salt grass. Gravel, water, and plants are recommended.

Eastern Shawnee Tribe of Oklahoma's Method of Focusing Title V Permit Reviews Using Backward-Trajectory Modeling and HYSPLIT

April Crouch, Environmental Department, Eastern Shawnee Tribe of Oklahoma, Seneca, MO

In 2005, the Tribe had an enrollment of 2,362 members. The Eastern Shawnee Treaty ceded 22 square miles of land in the northeast corner of Oklahoma to the Tribe. There are other Tribal bands in the north and central parts of the state. Buffalo are raised on the Shawnee Band's land. The Quapaws Band in northeastern Oklahoma has the worst pollution problems and has Superfund grants to do testing.

Tribal air quality improvement efforts consist of several ongoing initiatives: a smoke-free homes program, assessments of homes and daycare centers for hazards to children, a program to discourage trash burning to limit dioxin release from plastics, and a program on how to burn wood fires more efficiently to limit particulate matter pollution, as well as performing the backward-trajectory modeling of ozone to focus Title V permit reviews.

The backward-trajectory modeling program is used to determine where contaminated air is originating. Ozone concentration data is obtained from the Quapaws air monitor located about 5.5 miles northwest of the Reservation. Trajectories represent the flow path of a parcel of air over time. Six trajectories are monitored per day, starting at peak ozone hours, 11 a.m. to 4 p.m., especially between March and

November. Twenty percent of the worst days for ozone are used to focus permit reviews. HYSPLIT is used to examine the step by step procedure.

Crouch summarized the backward-trajectory procedure. Initially, eight-hour averages are downloaded from Air Explorer and information from HYSPLIT is downloaded. The 20 percent worst days are determined by sorting the file by descending concentration. The first 52 days were found to be the worst. Then the range of average flux, humidity, and ambient temperature is found for the 20 percent worst days. Any days for which the values fall outside of this range are eliminated.

The 20 percent worst days are plotted using a modified Excel file to create a GIS shape file. The 20 percent best days are determined by sorting ascending concentrations, which are then plotted on the GIS. Conclusions are drawn, and the areas from which trajectories originate on high concentration days will focus the permit review.

In 2001 the 5 percent best ozone days were when winds originated from the north, toward Kansas and Missouri, and had a higher wind speed than on other days. The worst five percent ozone days come from the south and Arkansas, and Dallas, Texas, during which the air moved slower. Patterns were similar for 2002 – 2005. The data show that permits from operations in areas north of the Tribal lands are not a concern, but those from the south need more intense focus.

The Tribe's environmental department was established in 1997, and it provides a number of services:

- Drinking water testing
- Groundwater monitoring
- Recycling
- Radon testing in homes/daycare centers
- Environmental assessments of homes
- Food service inspections
- Land management, and
- Leased properties management.

Grants received for 2005-2006 include funding for the following programs: Section 106, watershed compliance, Section 103 air compliance, wetlands, pesticides, groundwater monitoring, radon testing, GAP, a HUD grant, and self-governance. For radon testing, a staff member places a radon canister at breathing level in an individual's home or a daycare center for seven days in the rooms most occupied (not kitchens or bathrooms). If test results are above 4.0 picocuries per liter (pCi/l), then a second test is done and both are averaged. Long-term testing and mitigation may be needed.

For a pesticide project, groundwater well samples are taken at Tribal members' homes. Analysis is done for nitrogen, phosphorus, and pesticides from agricultural runoff. If high levels are detected, an activated charcoal filter is installed in the home water system. In another program, the Lost Creek Bridge was replaced because the original, low bridge did not allow fish to swim through the channel.

An EPA 106 watershed grant has been used to monitor water quality monthly in three streams. Samples are analyzed in the Eastern Shawnee environmental department lab for flow, nutrients, dissolved oxygen, turbidity, pH, conductivity, and *E. coli*. Tests are run during the recreation season, and swimming advisories are posted when levels are high. The highest *E. coli* rates have been found in Lost Creek where cattle swim and drink. There is also discharge from a lagoon-style waste treatment plant in the watershed.

In Ottawa County, Oklahoma, lead and zinc mines were operated until the 1970s. Around 48 million tons of mining waste was left above ground (chat piles), resulting in the Tar Creek Superfund site. In 1979, blood-red acid drainage ran from the site whenever a rain event occurred. One spot burned the hair on horses' legs it was so acidic.

The site was added to the National Priorities List in 1983, and in 1996 EPA spent more than \$100 million cleaning up lead-polluted yards where children played and had high lead blood levels. The state bought out 52 families with children less than six years of age to move them from the contaminated area. EPA is attempting to buy out the remaining 1,600 residents due to the subsidence risk from underground mining that occurred in the area. Schools and utilities will be shut down in one year. Cardon, OK will be a ghost town. For more information on this project, visit <http://www.leadagency.org>.

Questions and Answers

Q – How are you doing radon mitigation where people still live?

A – The older homes where people live have been tested, and they don't have radon.

Q – What is the source of drinking water?

A – Drinking water wells are 5.5 miles away and are located on a different aquifer than the one near the contaminated site. The aquifer has been tested for pesticides and heavy metals with no contamination found.

Comment – For the children who have lead concentrated in the fat of their abdominal cavity, perhaps the levels could be documented and compared to levels years later. Third world countries have heavy metal concentrations showing up in people.

Q – Why is the runoff red?

A – The color can occur from lead, arsenic and zinc.

Comment – Usually when there is lead present, arsenic is also occurring.

A – In fish tissue samples last year, arsenic was found to be very high. The sample will be retested this year using a different method.

Q – Have you tested whether the mine tailings on the surface chat pile (5.5 miles from the environmental department office) result in lead deposition near the office? Soils would need to be tested.

A – We could team up with the Quapaws Band to do this testing. There are grants for testing at the Superfund site.

Q – Can remediation be done along the streams using plants that take up toxic materials? Animals and cattle could eat the plants and get high levels of toxic chemicals.

A – Cattails are being planted along Tar Creek which take up lead and arsenic. Cedars might work.

8 A.M., WATER

Facilitators:

Troy Pierce and Marshall Cheung

The Utility of Indices of Biological Integrity for Depressional Wetlands in Central Oklahoma

Dena Hartzell, Iowa Tribe of Oklahoma, Office of Environmental Services, Perkins, OK
Joseph R. Bidwell, Iowa Tribe of Oklahoma, Office of Environmental Services, Perkins, OK
Craig A. Davis, Iowa Tribe of Oklahoma, Office of Environmental Services, Perkins, OK

The recognition of the values and functions of wetlands has led to an increased interest in determining the condition of the remaining wetland habitat. In Oklahoma, approximately 66 percent of wetlands that originally existed in the state have been lost; due mainly to agricultural practices and urbanization, but little research has been completed on these systems.

The index of biological integrity (IBI), used to determine wetland condition, is becoming a well-established assessment method in other parts of the United States. The IBI was first developed for fish in streams. Over the past 20 years, it has been used to assess wetlands in Ohio and Minnesota. Most researchers use macroinvertebrate and plant assemblages to determine IBI.

The Zoology Department at Oklahoma State University in cooperation with the Iowa Tribe of Oklahoma evaluated the ability of metrics from previously developed IBIs to determine the condition of depressional wetlands in central Oklahoma. Objectives were to determine similarity between created wetlands and natural wetlands and to evaluate the response of metrics from previously developed IBIs to disturbance in Oklahoma wetlands. This project also compared old farm ponds that had wetland vegetation to natural wetlands. Between September 2003 and July 2005, the plant, macroinvertebrate, and bird assemblages of wetlands were surveyed.

Wetland selection consisted of

- 18 palustrine, emergent wetlands
- 12 natural wetlands, and
- 6 created wetlands.

Wetland disturbance score was determined by the following factors:

- Rating from 0 to 30
- Buffer zone
 - Width (>50m, <10m)
 - Surrounding land use
- Vegetation within wetland
 - Mowed
 - Livestock activity
- Hydrology
 - Levees/dams
 - Installed outlet/drainage structure

Abiotic factors were also included. Water depth was measured. Quanta Hydrolab provided temperature, pH, dissolved oxygen, salinity, turbidity and specific conductivity measurements. A Hach Test Kit was used for total phosphate and nitrate readings and standard methods were used to determine alkalinity and hardness.

Vegetation assemblage was assessed in fall 2003, summer 2004, and summer 2005, including a cover map with one transect with at least four quadrants in each habitat type percent coverage, identified to lowest taxon. Macroinvertebrate assemblage was assessed through seasonal sampling between October 2003 and July 2005. Two samples were taken from each habitat type with at least four samples per

wetland using a d-frame dip net and identified to the lowest taxon. Avian assemblage was also assessed through seasonal sampling between October 2003 and July 2005 using a 10 minute point count and playback tape with no precipitation and <25km/hr wind. These tests were done three times per season at three week intervals.

Overall, the avian assemblage (13 out of 14) and the macroinvertebrate assemblage (13 out of 16) had the most metrics exhibiting a significant relationship with disturbance scores, while for the vegetation assemblage, only 7 out of 12 metrics had a significant linear relationship with disturbance. The number and type of metrics that had a significant relationship with disturbance varied seasonally and with wetland size. The IBI is a potential wetland assessment method for Oklahoma, but metrics pertaining to Oklahoma fauna need to be developed.

Natural and created wetlands appear to have assemblages with similar characteristics because only 6 out of the 43 metrics across the three assemblages were significantly different between wetland types. Jaccard's similarity index of species present between wetland types was 38 percent for plants, 56 percent for macroinvertebrates, and 65 percent for birds. Based on comparison of the individual metrics, it appears that multi-metric assessment methods can be used to determine the condition of created wetlands.

Some things were discovered that should be considered because of our water. The impact of cattle needs to be considered more closely as their presence has been shown to increase species diversity but this study did not capture that impact. Caution should be used when using both natural and created systems in assessments. Caution should be used when determining which assessment method to use for determining created wetland health. Caution should also be used when using created wetlands in assessment methods. IBI showed a promising level 3 assessment method for Oklahoma. It should be noted that birds and macroinvertebrates provided more information than plants.

Questions and Answers

Q – Were all the assemblages on small and large wetlands combined in the comparison of natural versus created wetlands?

A – For metric response they were separated but for the comparison of natural and created they were combined. Most of the large wetlands were created. There were twice as many natural wetlands that were mostly small.

Q – How did you standardize d-net sampling?

A – We tried to standardize by dipping the net to the same depth and by keeping it to a minute.

Q – Did you use HGM?

A – They are working on that now.

Q – Were the created wetlands all old farm ponds?

A – We had one created to be a wetland. All the others were abandoned farm ponds. There are a lot in Oklahoma.

Q – What is the tribe going to do with this data?

A – The school is supposed to give the data to the Tribal water program but we didn't get all the IBI on Iowa land. There were only 4 wetlands on the reservation so we were discouraged from going forward. We're waiting on the state.

From Greens to Blue-Greens: An Investigation of Algal Blooms in the Penobscot River

Daniel Kusnierz, Department of Natural Resources, Penobscot Indian Nation, Indian Island, ME

For more than 12 years, the Penobscot River has experienced regularly occurring episodic algal blooms during the summer months and seen the community composition shift from green algae to Cyanobacteria. The most recent and serious bloom contained both *Anabaena* and *Microcystis*, producing no anatoxin-a and low levels of microcystin in samples collected. This bloom reached all the way to the ocean from its beginning 75 miles upriver.

The presence of this bloom prompted the Penobscot Nation Water Resources Program (<http://www.penobscotnation.org/DNR/Water/wrhome.html>) to issue an advisory to tribal members using the river. Will the presence of algal reproductive structures in the sediments forever change the composition of future blooms? The Penobscot Nation is working with the U.S. Geological Survey, Bigelow Laboratories, Maine DEP, and others to answer this and related questions. This presentation reviewed the research being carried out by the tribe's water resources program to describe the extent of the bloom problem and to determine the factors causing the bloom, and posed questions about what will happen in the future. Daniel Kusnierz has been the Program Manager since 1993. His description of the Tribe's response to concerns over the algae blooms follows:

The Penobscot Reservation is pretty unique. Basically it consists of the Penobscot River. In a settlement in 1980 the tribe gave up its claim to approximately two-thirds of the land in the State of Maine and retained the river and all of its islands from shore to shore. The main location where tribal members live is Indian Island. The tribe also has trust land throughout the state.

We have multiple paper mills and municipal waste all over the state and everything gets dumped in the river, so it is a big concern for the reservation. In the mid-1990s we were doing baseline monitoring and noticed that the river was getting cloudy. We didn't know if this was caused by algae or just a result of rain upstream. We started looking, driving around and made note of where the river was cloudy and where it was clear. We began to suspect it might be an algae bloom, and if it was, we wanted to know where it was coming from.

We determined that there were blooms and they were originating in the lower West Branch and Dolby Pond but species composition was diverse and there were no toxin producers found at that time. The West Branch of the river is a highly dammed section. We set up sampling locations throughout this area. We were also interested in looking at Dolby Pond. Dolby Pond is impounded. We put together a grant proposal with EPA to study this intensively and were able to combine it with a waste load study that the state was doing. So, we were able to do a lot of samples, but the bloom didn't return. In 1997 there were readings to give some concern. And we were able to narrow down the fact that algae blooms were first occurring in Dolby Pond.

In Maine phosphorus really is a limiting factor for where you are going to have algae blooms. In 1997 there were some volume limits on phosphorus so that may have affected the results we got. Then in 2001 the problem was really worse; major increases in phosphorus affected blooms. At that point the Maine Department of Environmental Protection (DEP) came in and said that they were going to put new limits on phosphorus. We could see the blooms seemed to be linked to changes in activity at the mills and were affected by phosphorus levels.

Then in 2004 we had the worst bloom ever and it was now dominated by cyanobacteria:

- *Anabaena macrospora*
- *Anabaena spiroides*

- *Microcystis aeruginosa* and
- *Microcystis flos-aquae*

All known toxin producers of anatoxin-a and microcystin

Only some cyanobacteria contain hepatotoxins or neurotoxins. All of them contain lipopolysaccharides (LPS) in their cell wall, which may be the cause of irritations of the skin, digestive tract, respiratory membranes, eyes, and ears. The implications of the present state of knowledge for surveillance and management are that any mass development of cyanobacteria may be a potential health hazard.

If the cyanobacterial cells contain hepatotoxic microcystins, cause for concern may be higher because of the chronic effects of this potent toxin. Although *Anabaena* was clearly the dominant species (90% of biomass in sample), they were not producing detectable levels of anatoxin-a (neurotoxin). *Microcystis* was present in low levels (10% of biomass in sample), but they were producing detectable levels of microcystin (hepatotoxin) at 0.20 µg/L. Guidelines for managing risks in recreational water are 10 µg/L total microcystins or 50,000 cells/mL for children and 44 µg/L total microcystins or 220,000 cells/mL for adults. (See www.nhmrc.gov.au/publications/synopses/eh38.htm for guidelines.)

What does this mean for ingestion risk? Microcystin levels were below WHO levels for finished drinking water (1.0 µg/L). What does this mean for contact risk? At 20 µg/L microcystin in the top 4 meters of surface waters we had a moderate risk situation. What this all really means is that whenever you have an algae bloom, especially in the Northeast, you should be concerned. Depending on the levels of toxins present, adverse health outcomes range from skin irritations and gastro-intestinal illness to long-term illness or even death. The impact on pets is also important to remember.

Dolby Pond is like a lake with a river running across the bottom of it and you could see the algae flow. By mid Aug 2004 the bloom extended down the coast to Lincolnville – over 75 miles downriver. We recommended that people and their pets and livestock avoid the large areas of green algae. These blooms actually reached all the way down the river into the Penobscot Bay.

The blooms seemed less visually intense below dams but had higher levels of microcystin. We have to wonder, are dams potentially breaking up algae filaments and increasing growth? The blooms are constantly moving around, so it would help if we could find some method for continuous monitoring.

The discharger(s) have decreased phosphorus and Maine DEP is proposing to develop phosphorus criteria. If we could remove phosphorus, would it make a difference, would it affect the underlying condition, or would just a small change in phosphorus in the future cause problems? But the biggest questions are...have we seen a permanent species shift? And will other factors contribute to or trigger a bloom, such as weather or nitrogen to phosphorus ratio. Tribal members cannot carry out sustenance fishing due to toxics including dioxins, PCBs, and mercury. These blooms further impair the Tribe's ability to carry out cultural and traditional practices including sweat lodges, canoeing, gathering plants for food and medicine, and swimming.

Next Steps

Additional work needs to be done and data gaps filled in the following areas:

- Define what constitutes a bloom
- Determine onset and severity of blooms (especially relative to other years) possibly using data sondes
- Determine factors affecting blue-green algae blooms
- Determine taxonomy and community composition

- Do P sampling
- Determine role of dams as “cookers,” and
- Investigate the impact of tailrace or turbines on bloom dynamics.

Questions and Answers

Q – What are the effects on the ecological receptors?

A – That’s a great question but we don’t know. We presented some of this and talked to a lot of people who are experts on blue-green algae who wanted to know that too. Has anybody heard about the effect on wildlife?

Comment -- I’ve seen two-headed frogs in Minnesota and heard it was related to some chemical contamination.

Q – We’re trying to establish wild rice in our wetlands and a lot of people came back from working in the water with rashes; could that be related?

A – Could be, algae is one of the things that could cause it.

Q – We don’t have resources to test for toxins. Do you know where we could get help with that?

A – We can get some names for you. University of New Hampshire is doing a lot of work on cyano bacteria and blue-greens and suggested we need to focus on the fact that if you have them, you have a problem; it’s not just a problem if you have a high concentration of toxins.

Comment – I would recommend that you just decide what levels and species composition matter to you – come up with something specific to require of dischargers. I think you should get rid of the word bloom.

A – I think that sounds good. I’d like to get away from the concentrations also, but the Department of Environmental Protection needs something specific.

Q – I have a question about the increase in phosphorus. Did the dischargers up production or change treatment practices when you saw levels change?

A – We were told a lot of different things. We were told they weren’t adding phosphoric acid to the system but as time went by it seemed clear that they were. It seemed as if, when the plant that was shut down for awhile came back online, there was no communication between the paper maker and the treatment plant.

8 A.M., TRAINING: OVERVIEW OF SCIENCE GRANTS AND TIPS FOR SUCCESSFUL TRIBAL PROPOSALS (INCLUDES PART)

Facilitators:

Elizabeth Resek and Christine Berini

Introduction to GPRA/Measures/PART

Elizabeth Resek, US EPA, Office of Prevention and Toxic Substances, Office of Science Coordination and Policy, Washington, DC

Grant Writing Overview: What to Look For in an RFA; How to Partner With Academics and Other Institutions

Kathy Hill, J.D., LL.M. and Joseph Dupris, Ph.D., J.D., Quail Plume Enterprises

The Grants Overview Session consisted of the following presentation topics:

- Introduction to GPRA, Measures, and PART

- Grants Overview (a “cookbook” approach to grant writing (using a successful grant application as a teaching instrument); how to partner with academics and other institutions; tips)
- EPA Regional Overview (grant work plans and accountability; available resources and how to access them; a student exercise based on a successful grant application (same grant used as a teaching instrument by other presenters)
- Tribal Success Story: Navajo Nation National Science Foundation Grant

Links and publications to the American Indian Environmental Office website:

<http://www.epa.gov/indian/>

<http://www.epa.gov/indian/tgrant.htm>

<http://www.epa.gov/indian/overcat.htm>

Region 10 website for grants information:

<http://yosemite.epa.gov/r10/tribal.NSF>

<http://yosemite.epa.gov/R10/TRIBAL.NSF/webpage/Tribal+Grants>

Region 10 Environmental Results Information:

<http://yosemite.epa.gov/R10/ECOCOMM.NSF/webpage/measuring+environmental+results>

Profile of Tribal Governmental Operations – Appendix F

<http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/tribal.html>

EPA Grants Office: EPA Rules, Regulations, Policies, etc.

<http://www.epa.gov/ogd/>

EPA Strategic Plan

<http://www.epa.gov/ocfopage/plan/plan.htm>

Environmental Results under EPA Assistance Agreements

<http://www.epa.gov/ogd/grants/assistance.htm>

EPA Policy for Competition of Assistance Agreements

<http://www.epa.gov/ogd/grants/competition.htm>

Program Assessment Rating Tool (PART)

<http://www.epa.gov/ocfopage/part.htm>

Government Performance and Results Act (GPRA)

<http://www.epa.gov/ocfo/planning/gpra.htm>

National Center for Environmental Research

<http://es.epa.gov/ncer/>

Grants.gov (Find, Apply & Succeed)

Overall, the comments received from those attending the trainings were positive. While the student exercise “scared away” as many as 10 individuals (session attendees literally left the room), those that remained participated fully, were very energetic, and seemed to really enjoy the class exercise. From the session organizers’ viewpoints, the student exercise was helpful to the participants – we would recommend something similar in other training sessions where appropriate.

Comments included the following:

- Strong aspects of the course: step by step process (logical/easy to follow), group exercise, “first person” experience, and knowledge of presenters.
- Aspects that did not work as well: course was too short; needed more indirect cost information, pace was too fast and there was too much information.

8 A.M., TRAINING: OVERVIEW OF WATER QUALITY STANDARDS FROM A TRIBAL PERSPECTIVE

Facilitator:

Nancy Schuldt

This is a tribally focused water standards course. Water quality standards are the cornerstone of state, territory, and tribal water quality standards management programs. This course introduced all aspects of the water quality standards program, including the interpretation and application of water quality standards regulation, policies and program guidance, the development of water quality criteria (human health, aquatic life, nutrient, and biological), and other facets of the water program. Highlights included topics ordinarily covered by EPA’s Office of Water “5-Day Water Quality Standards Academy.”

Treatment as a State

Nancy Schuldt, Fond du Lac Reservation, Environmental Program, Cloquet, MN

Dan Mosely, Environmental Department, Pyramid Lake Paiute Tribe, Nixon, NV

Tracey Ledder, Bad River Band of Lake Superior Chippewa, Odanah, WI

Nancy Schuldt opened the first morning session with an introduction on Treatment as a State, or TAS, and the appropriate citations from the Clean Water Act that define the application process and the eligibility requirements for a federally recognized tribe to assume water quality authority for waters of the reservation. This introductory presentation was an edited version of the introduction usually provided at a tribal water quality standards academy. At a previous tribal WQS academy held in Polson, MT (Sept. 2005), this particular aspect of a tribal water quality standards program elicited many questions and much discussion about what constitutes a complete application, the timeliness of EPA review and decision-making, and local/regional political opposition from states.

Dan Mosely, representing the Pyramid Lake Paiute Tribe, then presented a case study of his tribe’s experience in applying for TAS, first for §106 program authority (awarded in 1990), then for the authority to promulgate tribal water quality standards. Dan explained other aspects of the PLPT water quality program history, specifically their relationship with the University of California-Davis in developing their water quality standards. Their approach included significant limnological monitoring and research, field and lab experiments, and modeling, and relied heavily upon biological data to yield critical information for developing standards and making management decisions. The results of these early studies have been published as technical reports, and also in peer reviewed scientific journals.

The PLPT application for TAS to develop water quality standards was originally submitted in 1994, but approval was held until a regional stakeholder agreement, the “Truckee River Water Quality Settlement Agreement”, was completed. An updated TAS application was submitted in 2004, but as of yet, has not been approved by EPA Region 9.

Tracey Ledder, of the Bad River Band of Lake Superior Chippewa, gave a case study on the Bad River Band’s decision to move forward with a tribal water quality standards program, and their approach to this objective. Protecting the Band’s water resources is a clearly stated goal in the tribe’s IRMP, and they

have been monitoring water quality across the Reservation since the late 1990's, including some cooperative monitoring with a local non-profit watershed organization.

Back in 2000, the Bad River Band requested that EPA, during its efforts to promulgate 'core' water quality standards for Indian country (the vast majority of tribes without their own approved WQS), develop 'tailored' standards for Bad River. This option was offered to tribes in Region 5, and those tailored WQS are still on the books for Bad River; as they continue to move towards a full tribal program, the standards will be revisited.

Bad River has drafted several iterations of their TAS application for WQS program authority, from 1996 through 2006, because of changing legal staff. EPA reviewed two versions in 2005, and a final application was submitted in March 2006; deemed complete in August 2006. The public comment period was still open at the time of this Forum, and Bad River staff visited with local town boards and other cooperators as a courtesy "heads-up" to those organizations, and to answer their questions.

Use Classification System and Beneficial Uses

Nancy Schuldt, Fond du Lac Reservation, Environmental Program, Cloquet, MN

Robert Gomez, Environmental Director, Taos Pueblo Environmental Office, Taos, NM

Nancy Schuldt gave an introduction to the topic of beneficial uses and developing a use classification system, an edited presentation from a tribal water quality standards academy. In summary, designated uses:

- Are water quality goals
- Are established by authorized Tribes
- Are protective of existing uses, at a minimum
- Must be consistent with the CWA
- May include subcategories of uses
- May differ among segments of a waterbody
- May not include waste transport or assimilation, and
- May be removed under certain circumstances.

Robert Gomez, Director of the Taos Pueblo Environmental Office, presented a case study on their development of designated uses, "Incorporating Traditional Knowledge into Tribal WQS: Setting Designated Uses Consistent with Cultural Considerations". He spoke about consultation with the tribal elders, who had provided testimony to Congress: "In all of its programs the Forest Service proclaims the supremacy of man over nature; we find this viewpoint contradictory to the realities of the natural world and to the nature of conservation... The idea that man must subdue nature and bend its processes to his purposes is repugnant to our people."

He explained that in the early phase of the Taos Pueblo WQS development, the tribe asked about the goals for each watershed. Traditional tribal knowledge was incorporated into monitoring design, e.g., known river use sites, drinking water, herbs collected there, etc. Traditional knowledge was used to establish Designated Uses in WQS as well. Impairments and likely sources were identified, as well as Outstanding Tribal Resource Waters.

In 1990, Taos Pueblo and the rest of the 8 Northern Pueblos of New Mexico submitted applications for Treatment as a State pursuant to 1987 Reauthorization of the Clean Water Act §518. Shortly thereafter, the Pueblo of Isleta's WQS were approved by EPA. The 8 Northern Pueblos consortia developed a set of generic WQS based on the New Mexico WQS; Taos opted out and choose to develop a set of standards specific to its lands and Existing and Designated Uses.

10 A.M., PANEL AND DIALOGUE SESSION

Facilitator:

Dan Burns, American Indian Higher Education Consortium, Science, Technology, Engineering and Math Program, Bellingham, WA

How Can Tribal Colleges and Tribal Government Environmental Programs Work Together for the Benefit of their Communities?

Charlotte Clausing, Northwest Indian College, Division of Science and Mathematics, Bellingham, WA

Dawn Thomas, Salish Kootenai College, Native Plant Nursery, Pablo, MT

Bill Swaney, Salish Kootenai College, Department of Environmental Science, Pablo, MT

Gary Halverson, Sitting Bull College, Fort Yates, ND

Richard Janssen, Confederated Salish and Kootenai Tribes, Environmental Division, Pablo, MT

Dan Burns opened the session, making introductions of the panelists and inviting the audience to take an active role in the conversation. He asked that everyone consider two important questions while listening to the panelists in regards to how Tribal Colleges might develop in the future:

Is there value to collaborations? And how do we get that started?

Gary Halverson

Gary Halverson is a professor at Sitting Bull College. He began his presentation by sharing some of his personal story and continued from there to describe some of the challenges and possibilities he expects to encounter in the future.

When I started at Sitting Bull College, I was planning to teach agriculture. But no one signed up. I ended up teaching a lot of math and chemistry and physics.

I love my job. I feel that I have a love of the land and a reverence for it that fits very nicely with my Lakota neighbors. I've been working on a project, and we now have a thriving herd of Bison. I did the same thing with an equine program. Lakota people have been known for their horsemanship and that had kind of died out because a lot of students don't have access to horses, but working with the community we've been able to put together a program that everybody can support. Getting the community involved is difficult but it pays off in the end because everybody is willing to support the program.

More recently I've been working on setting up an analytical chemistry lab. I've been told that at Standing Rock about \$200,000 worth of monitoring samples are sent out annually to be analyzed. Why not set it up so that we can keep that money here? Train technicians to do the work, get the lab. So, we've got the lab set up and we're working on making it happen.

When I was asked to speak about how we relate to the tribe I thought we didn't, but recently we've had reason to do a lot of that. There are a lot of things that we couldn't help with – for example rabies testing on animals – but wanted to make a focused effort at Standing Rock with this lab and when I talked with the Tribe they encouraged me to expand it, look for other entities to do testing for. I'm hoping we can show that we can do a good job on these analyses.

Initially it is going to just be a student lab for students taking analytical chemistry and then it will be a research lab for them to do their research projects. They will be able to do their work on site and that will

be a benefit for them. In the future, I'd like to provide services for Standing Rock and then offer analytic services to others.

Charlotte Clausing

Ms. Clausing has worked at the Northwest Indian College as a Water Quality Field and Lab Technician II, Freshwater and Marine Re-circulation Aquaculture Systems and as a Salmon Hatchery Technician for the Lummi Tribal Fisheries. Her remarks described a recent project.

Our biggest project for partnership and success has been monitoring fecal coliform. EPA, the Department of Health, dairy farms, and the college handled management of the project.

We've progressed and we're doing quite a lot of sampling. I collect on one side of the area and my colleague collects on the other side. Within 24 hours our samples are analyzed and posted on the college website www.nwic.edu.

It's taken a lot of partnerships to make this work. Every semester I have new students. I adjust my sampling routes to their schedules. The college had an MOU to work with the Lummi Tribe; I was working on another project that stalled and so I started working with the hatchery group. We put on many hats. We work with everybody and when we get these people together the partnership works a lot better.

I was called on to help out with a 2nd grade school project. I bring along Coho eggs at the eye stage and manage the aquarium and then in May we release the salmon into the stream as part of the Lummi salmon reclamation project. This summer we've been working on setting up a new lab, getting involved in a lot more projects. Future research topics will include fecal coliform life cycles, surveying streams for location of Pacific Northwest freshwater mussel populations, and more.

Bill Swaney

William Swaney is director of the Environmental Science Department at Salish Kootenai College. He worked for the Confederated Salish and Kootenai Tribes for 15 years before coming to SKC. His experience includes wildlife biology and environmental protection program management. His remarks are summarized below.

I have a lot of perspective on what is happening or what should be happening in tribal colleges. I think what we've heard so far is that people will come to you and say, can you do this? Can you at least try? That will happen, so it's good to plan, have some forethought about what you will do when that happens. I'm going to talk a little about that.

We're really fortunate, blessed, being located in Pablo, Montana. We have alpine habitat, we have glaciers, some of the driest areas, we have lakes, streams, wetlands, in total the reservation is about 1.3 million acres. To my knowledge we have one of the only tribally designated wilderness areas.

Regarding our academic program structure, we offer a full environmental science program. Basically restoration is a plant focus, environment is a rocks and air focus, and in forestry we're offering a bachelor degree for the first time. We want to respond to the old growth foresters – there are a lot of people in the field near retirement age and we have a lot of young people who don't want to leave the reservation.

We are a very intertribal college; we had about 55 tribes represented at the college last year. We make our students volunteer. We have internships and research, and a senior thesis that requires tribal

involvement. We are, or should be, the generators of future tribal employees. Some of our graduates here are now tribal employees. We want to graduate good students as well as good citizens so we make them volunteer.

The tribal government has what's called a river honoring, where our young people are exposed to our elders. Students do everything from direct parking to working in the greenhouse. On a less significant basis, but where we hope to improve, some of the resource management programs have had some of our student volunteers. We have several major community events where students can get involved.

Students are required to do a research project. The capstone is a senior thesis where they take their internship research and put together a professional paper. Sometimes students do research that the tribe will be interested in. At times senior theses are directly or indirectly supported by tribal programs. Some examples...projects on owls, frogs, bears, and a swift fox reintroduction project included a student intern. What kills calf elk? This is an interesting issue for wildlife managers, that is, how well can you count calf elk from a helicopter? We have some very high tech things going on, landscape imaging, land management.

A significant issue is the widening of highway 93 through our reservation. We're concerned about the animals, especially the turtles. Students can be involved in a research project that may be useful to tribal management. Obviously, preparing future tribal employees is one of the most important things we can do for the Tribe.

Bringing in guest lecturers from the tribes, staff members as adjunct instructors are ways we bring tribal issues into the college. Taking the students on field trips is also a way we give students experience and offer mentors in the field.

Challenges? We could be doing more. Tribal government allows eight hours of education leave for employees to take classes but there is resistance. Sometimes hiring brings up tribal preference issues. Another area for opportunity to have collaboration is to have tribal members involved on the board.

Dawn Thomas

In 2001 Dawn Thomas received her Bachelor of Science degree in Environmental Science from SKC. In the summer of 1998 as an internship student, she was hired to start a native plant nursery and environmental restoration program under the supervision of Virgil Dupuis. Dawn now grows native plants for the Confederated Salish and Kootenai Tribes' restoration projects. She is also writing a native plant growing manual for the Tribal Forestry Department. She spoke about the involvement of students at the greenhouse on a variety of projects.

I think the best thing I have done is to get my husband to quit the tribe and get to the college. He has worked for the tribe and with EPA Region 8 for so long that he knows so much about what is going on and he can share that with his students.

I run the native plant nursery and my first job was as an intern identifying native plants in part of the reservation. Lately we have gotten into seed collection. Students get a good hands-on learning experience.

Students work in the greenhouse, in the field; this really helps with botany and forestry classes, knowing habitat and how to collect the seeds.

A project that we've worked on is highway mitigation. We did nine acres of highway mitigation. We collected seeds and now the tribe is growing all native materials. The seed is grown and then put back in the area where it was collected.

Yellow iris is a really bad weed on the reservation. We've worked with that and sprayed these areas and replanted the stream to make it more natural.

Richard Janssen

Mr. Janssen is the Division Director for the Natural Resources Department of the Confederated Salish and Kootenai Tribes. He began his talk by asking, how can tribal college and environmental organizations work together for benefit of the community?

I look at Bill Swaney as an academic now – and I expect him to ensure that he provides potential employees for jobs in the field where I need them. It seems since the Brownfield Program was established EPA has money for this and I am always looking for graduates and tribal members to hire. School teaches you how to walk, but out in the field your experiences really pays off. Our SKC graduate has worked really hard and soon is going to be promoted to a position as a full-time program manager. I have a good relationship with Bill, but we do not meet as often as we should. Due to funding cutbacks we are having trouble moving forward, there's more paperwork, more business-related goals and objectives. If we don't meet those goals and objectives, we won't get the money -- so maybe that money can go over to Iraq or something.

Recently we signed an MOU with EPA; they want tribal students to work at EPA, in the region and at headquarters, but most Indian people want to live on the reservation. So we are working to set up the program so that students can come to us on the reservation and spend time working with the people and the land. I think EPA is realizing that if they want to make a more successful effort to get Indian people to work at EPA they need to work with tribal government. A lot of my jobs lately are based on EPA funding.

They came to me and said they had money for work in pesticides. I took the maximum I could to hire a full-time person and asked for someone with a bachelor's degree but no experience needed. This person will become a fully licensed pesticide expert. We cannot forget those Indian students who are out there who don't live on the reservation, or those who have moved away. We need to remember they are out there. We need to give them incentive to stay with us or come back to us. It seems like our best and brightest sometimes get taken out from under us.

In our department we currently have no money for interns; we can provide volunteer positions to provide experience for students over holidays at Christmas and spring break, but they usually want to get paid for working in the summer. SKC has a water quality testing lab that the Tribe's Water Quality Control brings all our testing to – that's worth about \$35k a year. So we take advantage of that. Some people say tribal colleges don't prepare students well enough but I think it's the student that determines how well they are going to do.

Facilitator – Thank you panel. Now I have a question for the group and I'd like us all to discuss this. You're all very busy; do you feel like there is a real benefit to put the time in to build these relationships? Do you feel it is a priority? We'll list some thoughts on this chart and then hear some comments and take some questions for the panel.

Flipchart Notes

Negatives

- ◆ Requires work
- ◆ What do you do when key people leave the tribal college or tribal government?
- ◆ Environmental goals being made by outside organizations determine tribal agenda
- ◆ Funding cutbacks

Positives

- ◆ Shared resources, MOUs
- ◆ Collaborations, people moving back and forth between college and tribe
- ◆ Tribal members on college boards
- ◆ Educational leave for Tribal employees

Comment -- I came to this session because I wanted to recognize what you are trying to do, coordination and collaboration between schools. I think it is really important to think about where we are going in the future. Some things we are starting to adopt out here is looking ahead 100 years, and looking back 100 years. Where do we want to be in 100 years? Climate is a big issue in a lot of areas -- population, energy, water, waste treatment, transportation -- all have a big effect. Labs are important with so much need to deal with pollutants and health monitoring. Once you start a water quality lab it branches out; you want to build for growth. Universities and colleges can help with getting those structures together. The ecosystem restoration process not only restores the ecosystem, but the culture. The greenhouses are going to be useful in future, to deal with climate change, population growth. Artificial propagation is going to be part of the future. If species migrate out of our reservation, we can't follow them, so we need a way to bring them back. How in governance do we incorporate what we learn from our colleges and universities? How do you get that information and pull it into a governance form to manage for the future? Once you get the colleges together you'll be able to answer a lot of the questions that tribal leaders are asking. I think you've got the capability to start doing that here.

Comment -- As you move towards four-year degrees, keep in mind we have graduate degrees. We are working on a program in tribal governance. We will have a graduate program with a special tribal track in the future and are working on programs where students can spend more time at home, and on bridge programs.

Comment -- The most important thing that we can do is to develop the strengths and partnerships that we have. None of us can do it on our own. At ITEP (Intertribal Environmental Professionals) at Northern Arizona University we try to do that as much as we can, but we need to strengthen our relationship with other tribal colleges. The support Rick is getting from EPA for the pesticide program is important. More people need to know about what's going on, talk about models that are successful, going beyond Region 8. If there's anything that ITEP can do to help with that, let us know.

Mr. Swaney Responds -- I've been lucky to be in places where there's been tremendous growth. I've been part of what we call the tribal college movement. They are miracles. We were told that it would never work but we've seen the growth in EPA with the "Indian desk" where environment issues are being brought to the highest levels. There's been a huge amount of growth but we're so busy sometimes chasing the money trying to sustain our programs and we need to be mindful of why we exist. Part of our mission is to assist our tribal governments. So these partnerships are too important not to develop. There is nothing more important than to develop the human infrastructure in Indian Country.

Facilitator -- My next question is, how can we work with outside organizations? Part of the answer is that we need to invest the time to strengthen the relationships between tribes and colleges but what about

outside organizations? How can they help? For instance the EPA Tribal Science Council asked us, "How can we work with tribes?"

Comment -- I think the answer is to build a strategic plan that demonstrates how these colleges work and what they can produce for tribal people. I think you should target Microsoft and other organizations that say they are looking for leaders. We need to be ready when things in Washington change. I think the rest of the country looks to Indian Country to answer some of these questions; they think we know something they don't -- and they're right. When EPA starts getting back to work we need to be ready with a plan.

Facilitator -- I've been working in situations where I've seen the tribes or agencies aren't working with tribal colleges and I just wonder how we can build those relationships.

Mr. Halverson Responds -- I went to a meeting where the agency sat down and said, OK, how can the tribal colleges help us meet our objectives? And, even here, I think this meeting is still being driven by an EPA agenda. I think we need to sit down and talk about the fact that we can work together, but what is important to the Tribes and *our people* has to be considered. The effect on seven generations, for instance. What kind of direction do we want the four-year degree in college to take? These are some of those questions. I think there are real things we can work with EPA on for the benefit of both groups and develop programs that are relevant to the tribes at the same time, but we need more discussion and not to be bulldozed.

Comment -- I have worked for the Superfund program for 18 years. I've seen a lot of things and participated in a lot of activities and want to say something as an employee. I realize we have a lot of problems collaborating with tribal colleges. In my community we have one, but it's been hard to work with them. Usually the money is so small that the administrative cost takes up half the budget. And we don't have a grant writer on our staff. How can we better serve the people? For the past ten years I've been working on the impact of abandoned uranium mines and when you work on that there are always health concerns you have to look at. But we do academics and you have to prove what the problem is and we're restricted in Superfund to do certain work. I always tell my supervisors and ask for more funding or bring in the health department or go to the tribal and other colleges and universities for help. I know the possibilities are there. Summits and conferences are places where we can gather and provide some strategies. We used to have interns who were training in the field and then we started getting interns that were majoring in physical education, not science. We wanted people who would be able to replace us when we retired, but where are they? There's no mentoring going on. The other issue is: having a laboratory. We wanted to establish a lab but we hardly have any land. But there are kits and stuff you can do in the field, though. A lot of work I do now, you can't send to independent laboratories unless they are part of EPA or a state program and they can't always do all the things you want them to do. Sometimes the only thing you can do is raise the yellow flag when you're in the rank and file of the tribal government. I just wanted to say that.

Comment -- I just wanted to suggest that one of the outcomes of this conference could be for this dialogue to continue as part of this conference. So that we can work on something between now and next year.

Facilitator -- There are several ways that we can think about this. USDA sponsors a monthly teleconference that is open to all tribal colleges. I don't know if we could do something like that through EPA or USDA. I don't think we want to wait another year, but we need to find some kind of way to keep the conversation going.

Comment -- I'm on the Tribal Science Council and I am wondering if we could put some tribal college professors on the council. I don't know if it is possible but I think we could look into that.

Facilitator – We'll pass around a pad and if you could put your information here, if you're interested we'll figure out if we can do an email group or something. We'll get all the tribal colleges involved and we could invite tribal environmental people to that as well.

Comment -- I think it is important to get some tribal scholarship people in that group. We have a student who has been working on that, on getting that connection between tribal jobs and education.

Facilitator -- Hopefully we can keep this going! There is a portal site for all science faculty at all the tribal colleges, the address is <http://stemrc@aihec.org>, and you can also contact me at my email address dburns@aihec.org if you are interested in finding out anything about local contacts at the tribal colleges. Thank you all.

10 A.M., WATER

Facilitators:

Dana Davoli and Connally Mears

Activities of the Grand Portage Reservation, MN, to Protect and Restore the Aquatic Habitat in Lake Superior

Bradley Frazier, Director, Environmental Programs,

Ryan Nelson, Nonpoint Source and Solid Waste Coordinator,

Margaret Watkins, Grand Portage Reservation, Environment Department, Grand Portage, MN

The Grand Portage Reservation is at the northeast tip of Minnesota along the Canadian border and Lake Superior. The Reservation has 56,000 acres, 24 miles of shoreline, and bays and islands. About 550 people live on the Reservation, which is relatively pristine and well cared for by the Native Americans. Outside interests often want to study the area because there is little pollution or development there. Sometimes the Tribal Council refuses. Management practices there are all based on sound science.

The 1854 Treaty ceded territory for Grand Portage, Bois Forte, and Fond du Lac Reservations. The Grand Portage Tribal Council is the governing body for the Reservation. Under the Trust Lands and Natural Resources Division, there are departments for land use, natural resources, environmental protection, air, water, solid waste, nonpoint source pollution, forestry, biology, GIS, conservation and management of wildlife, and emergency management.

Since 1995 the Tribe has had a land use ordinance that protects the land and waters of the Reservation, provides for review of building permits, and environmental assessments. A solid waste ordinance has been in effect since 1998, and a permit program for construction and demolition waste was established in 1999.

Regarding land use, the northeast tip of the reservation and islands enjoy a preserved status. Commercial area is mostly near Grand Portage, and most residential area is along the Lake shore, making water quality protection somewhat difficult. Much of the land is forested and the entire Reservation drains into Lake Superior. There is a buffer along every stream and lake for preservation purposes. The Tribe is working now on getting a 100-acre buffer around wetlands so the forestry industry can't affect the water quality.

The Grand Portage Tribe had one of the first integrated resource management programs in the U.S. The forestry department assures that best management practices are followed to protect water quality. A Forestry Resources Management Plan was established in 1986. Prescribed burns are used to restore native species. There is a wildfire protection and management plan, and GIS is used to protect resources.

For the past 15 years the biology department has been working on restoration of coaster brook trout, a threatened species, and reintroduction of Lake Sturgeon. The water quality department has been collecting data since 1995 to monitor mercury, surface and groundwater contamination, sediment, and water chemistry. Water quality standards were established in 2005. Currently, staff is developing nutrient criteria for the waters and trying to establish baseline emissions before proposed mining occurs on preserved lands. One company that owns mineral rights may be developing a platinum mine.

The Tribe and the Minnesota Pollution Control Agency have a cooperative agreement approved by EPA Region 5 to work together to develop and implement water quality standards, establish a no discharge zone for the Lake at the northeast tip of the Reservation and preserve joint jurisdiction over the shoreline waters. In this unique area is the Little Spirit Cedar Tree, a spiritual site now listed on the National Register of Historic Places. There are also petroglyphs, a nature preserve and rare plants that occur only in an arctic climate but live there due to the cold Lake waters and cold climate.

The wetlands program provides for wetland inventory and classification. Nutrient criteria are being developed for water quality standards to protect the wetlands. They consist of 46 percent forested wetlands, 44 percent depressional wetlands, nine percent scrub, and one percent emergent wetlands. A nonpoint source pollution control program was developed in 2005. One project is the restoration of Red Rock Creek from pollution where it runs through a gravel pit. NPDES permits are issued for construction sites and a rain garden project was established in 2006 – 2007.

Air quality is monitored and a haze camera is operated overlooking Lake Superior. The air is usually clear except when forest fires are burning. Some particulate matter comes from the south, Minneapolis and Chicago. Staff is trying to establish baseline air quality prior to mining in the area to determine if there has been any degradation. For renewable energy, the Tribe is seeking a grant for wind turbines. There is commercial-grade wind power potential with a rise in the elevation from 600 feet at Lake level to 1,800 feet at mountain top. Just one wind turbine could provide all the Tribal energy needs.

There are some specific problems in Grand Portage Bay that are exacerbated by a shallow bay with little mixing of waters, and islands that block the flow of waters. There is commercial development in the area. There are high fecal coliform bacteria measurements (from septic systems) in the Lake after significant rain events. Fine sediments accumulate, and new aquatic plants are becoming introduced to the area.

Changes have been noted in aquatic insect populations. There is a \$60,000 project with NTCS funding 50 percent to put best management practices into effect around the casino, including landscape rehabilitation. A specialist has been hired to create a rain garden to reduce contaminants in stormwater from running off the parking lot. A solid waste removal program is in place. The environmental department also has created a pesticide policy to avoid unnecessary spraying on the Reservation.

The staff has worked with the Minnesota Department of Health to create fish advisories. Emergency management staff train and prepare people for potential disasters that may harm them or the environment. All programs have an educational outreach component for the schools. Programs are in place to do walleye surveys and river surveys, to monitor sturgeon in the St. Louis River, and to monitor the growth of wild rice in the Lake. Resource contamination is assessed and fish are monitored for mercury. Tribal members are interviewed regarding consumption rates and eating patterns.

Enforcement programs are in effect for hunting, fishing, trapping, and harvest limits are set. Annual wildlife surveys are conducted, and moose populations are monitored using aerial surveys and radio telemetry. For more information on the Tribe's natural resource management and environmental protection programs, visit www.1854authority.org.

Questions and Answers

Q – What impact has been noted from iron mining and taconite operations in northeast Minnesota?

A – A lot of old mines exist in the 1854 ceded territory. There is no hunting or fishing there, but we are concerned about the air and water quality. There is some drainage to Lake Superior.

Q – Are there invasive species on the Reservation?

A – There are some plants, purple loosestrife, spotted knapweed, but not many in the Lake. There are some zebra mussels at Duluth.

Development of a Physical/Bioassessment Program on the Pyramid Lake Paiute Indian Reservation, Nevada

Daniel Mosley, Pyramid Lake Paiute Tribe, Environmental Department, Nixon, NV

The Pyramid Lake Paiute Reservation is about 31 square miles along the Lower Truckee River, including 12 perennial and 12 intermittent streams, wetlands, springs, and nearly 500,000 acres of land in Nevada, northeast of the Lake Tahoe area. The traditional subsistence food of the Tribe has been fish from Pyramid Lake, primarily the endangered Cui-ui (pronounced Kwee-wee) fish, which eat plankton and thus have lower levels of mercury than some species, and the Lahonian cutthroat trout, a threatened species. The larger fish eat smaller fish and have concentrated mercury levels.

Upriver from the Reservation is Reno, NV, an impoundment for urban use, and a sewage treatment plant. In 1994 it was a dry year, and when the city sewage treatment plant discharged effluent to the River, which runs through Tribal lands, many fish were lost. There is also a gold and silver mine upriver, the source of mercury in the fish. The larger fish, like trout, have mercury levels that exceed the standard.

An impoundment on the River for urban water use has also lowered the Lake level drastically. It is down about 80 feet from the early 1900s level. Fish often can't get into the Lake from streams because the water levels are so low, so the red-side shiner and other large fish species are declining. Species reintroduction programs have been undertaken. There are mountains across the Lake, and when there are heavy snows in winter, the Lake level rises. There is a large pyramidal rock in the Lake, from which the Lake got its name.

In the bioassessment program, Mosley has been examining the occurrence of aquatic insects as an indicator to determine water quality. Tribal members say that the animals speak to us. The leopard frogs, the amphibians, and the fish look like they're asking us to rescue them. We must listen.

Over 20 years of collecting data (1981-2000), Mosley has used several insect collection methods: the Surber sampler (1981-1999), a one-meter kick net (1992-1993), and a 10 x 18-inch kick net (2001 to present). Differing numbers of replications were used and three counting/identification methods: estimated counts (1992-1993), presence/absence (1994-1995), and total counts (1981, 1996 to present).

The best collection technique used has been the kick net with 500-micron net, 18-inches wide by 12 inches high to sample a 1 x 3-square foot area. Rocks are also scrubbed with a soft brush to get mayflies, which have very fragile wings. A garden trowel is used to dig three to six inches into the substrate to get burrowing insects. Habitat, fish, and chemical data can be entered into an Ecological Data Application System (EDAS), software that is free to Tribes.

After looking at EDAS metrics (70) and EPA metrics (14), Mosley could determine which metrics gave the best biological integrity assessment of the stream. The Pyramid Lake Paiute Tribe biological index consists of four metrics: taxa richness, percent EPT individuals, percent tolerant individuals and percent dominant taxon. These were used to give a score and narrative rating (excellent to very poor) for the samples. Between 1989 and 1996, sites appear to be improving. Biological index ratings moved from very poor or poor to fair and one excellent rating. Between 1996 and 1999 the index remained at fair and slightly higher for some sites with good water flow.

Benthic macroinvertebrate data showed that during a dry year, 1989, species such as scuds, snails, flatworms, and Asian clams declined in abundance on the Lower Truckee River. In a normal year, 1981, or a wet year, 1996, the species increased, especially midges, mayflies, and caddisflies. In a survey from 1999 to 2004, the number of benthic macroinvertebrates (total BMI/square foot) increased during high flow periods. Three miles below the water treatment plant, water quality was improved.

In another index of physical habitat assessment from 1999 to 2005, samples showed no areas capable of supporting diverse species on the Reservation. Recommendations include using a standard collection method, and for identification, methods such as total count or a standard sub-sample size (200 to 300 organisms) to allow for other types of analyses (e.g., RIVPACS). Also, non-biological data such as physical habitat assessments and water chemistry (pH, DO, conductivity, temperature) should be analyzed.

Next Steps

- Finish the PhyHab/BA QA project plan
- BMI IBI development
- Fish IBI development
- Algae IBI development, and
- Physical habitat index development .

Questions and Answers

Q – Do you have a recommended minimum flow for macro-invertebrates in the River?

A – Yes. The audience was referred to another presentation during the conference. In places where the River is healing, with sedges and willows growing, the insects proliferate. Even deer and mountain lions or cougars are coming back.

Q – How were wet, dry, and normal years defined?

A – By flow. A wet year was 500-900 cfs, a normal year 200-300 cfs and a dry year less than 50 cfs. The flow depends on snow pack each year. One year with heavy storms the Lake was up 15 feet. Models show we will get more rain, but we are also going to lose our fisheries, since a highway will be built on that site. A marina was built in the 1990s during the drought.

Q – Can you get rid of formaldehyde at the fisheries?

A – It is not used there.

10 A.M., TRAINING: OVERVIEW OF SCIENCE GRANTS AND TIPS FOR SUCCESSFUL TRIBAL PROPOSALS (INCLUDES PART)

Facilitators:

Elizabeth Resek and Christine Berini

Regional Overview: Grant Workplans and Accountability

Elizabeth Wendt, US EPA, Region 7, Kansas City, KS

The Regional Overview section emphasized the importance of incorporating measures for Environmental Results into the planning process of the work plan itself. The difference between competitive and non-competitive grants was examined; participants were introduced to the Competition Order, the required Logic Model for Environmental Results (competitive grants), and sources for more information. Many web-links for additional information were shared with the audience; EPA committed to put these links onto the TSC website under the Conference Website/Grants training section.

Navajo Nation National Science Foundation Grant

Dr. Willard Gilbert, Northern Arizona University, Twenty-nine Palms Band of Mission Indians, Tribal Environmental Protection Agency, Flagstaff, AZ

10 A.M., TRAINING: OVERVIEW OF WATER QUALITY STANDARDS FROM A TRIBAL PERSPECTIVE

Facilitator:

Nancy Schuldt

Antidegradation

Nancy Schuldt, Fond du Lac Reservation, Environmental Program, Cloquet, MN
Char Naylor, Puyallup Tribe, Environment Department, Tacoma, WA

Nancy Schuldt introduced the topic of antidegradation, again using a module from the tribal water quality standards academy to provide context and definitions for this required component of a water quality standards program. Authorized Tribes must develop and adopt an antidegradation policy to protect existing instream uses; high quality waters (water quality that is better than the levels necessary to support propagation of fish, shellfish and wildlife, and recreation in and on the waters); Outstanding National Resource Waters (ONRWs) designated by the Tribe; and waters where there is a potential impairment associated with a thermal discharge.

Authorized Tribes must also identify antideg implementation methods, describing how the policy will be implemented on a case-by-case basis. This implementation plan may be part of the Tribe's WQS, or referenced in the WQS and contained in another Tribal document. Essentially, the antideg policy is there to ensure that "existing uses and the level of water quality necessary to protect existing uses shall be maintained and protected"; it provides absolute "floor" of water quality condition – Tier 1 waters. High quality waters (Tier 2) should also be protected, at their higher functional quality, unless a compelling case can be made to the public that a proposed activity that would lower the quality of a Tier 2 waterbody is necessary to accommodate important economic or social development.

Finally, Tier 3 waters, or "Outstanding National Resource Waters" – ONRW – are those waterbodies for which no degradation will be permitted, except on a short-term or temporary basis. A Tier 3 water (waters of exceptional cultural, recreational or ecological significance) does not have to be high quality water; it could simply carry tremendous cultural significance that the Tribe wants protected from development.

Nancy had invited Char Naylor of the Puyallup Tribe to give a case study on their antidegradation policy. However, the Puyallup Tribe was entangled in litigation related to their water quality standards program at the time of the Tribal Science Forum, and Char was not able to give a formal presentation because of

the sensitivity of their status. Char was available for questions on this subject, though, and gave a brief, informal description of the Puyallup Tribe's antideg policy from the audience.

Outstanding Reservation Resource Waters

Nancy Schuldt, Fond du Lac Reservation, Environmental Program, Cloquet, MN

Gretchen Watkins, Lac Du Flambeau Band of Chippewa, Lac du Flambeau, WI

Nancy expanded on this topic, introduced earlier in the discussion on antidegradation and also during the session on designated uses. She gave an example of how the Fond du Lac Band had established their checklist and procedure for documenting the ecological, cultural, aesthetic or recreational values of a specific water body in order to recommend its special Tier 3 designation. At the time that the Fond du Lac Reservation Business Committee adopted the draft water quality standards into ordinance, they also approved the ORRW designation of five of the most productive wild rice lakes on the Reservation.

Gretchen Watkins of the Lac du Flambeau Band presented a case study on their process for identifying and protecting Outstanding Tribal Resource Waters (OTRW). Lac du Flambeau, along with its other designated uses, defined their Tier 3 waters in their antidegradation policy as follows: "Where high quality water constitutes Outstanding Tribal Resource Waters (or OTRW's), such as waters of outstanding cultural, spiritual, recreational, or ecological significance, as specified in the Tribal Water Quality Standards (in Table 2), the water quality shall be maintained and protected."

Under their antideg policy, existing ambient water quality in OTRW's may not be lowered; new or increased discharges to OTRW's are not permitted; and exceptions are defined. In determining which reservation waters are to be designated OTRW, Gretchen noted that they should have cultural, spiritual, recreational, or ecological significance. Currently, there is little infrastructure discharging to the waters of the reservation, and the majority of property within reservation boundaries is tribally controlled, but there is also room for future growth and development. OTRW is a mechanism for tribes to utilize their water quality authority to protect important natural and cultural resources.

1 P.M., EARTH

Facilitators:

Marshall Cheung and David Macarus

U.S. Geological Survey (USGS) Projects Supporting Environmental Science on Tribal Lands

David Meyer, Science Applications International Corporation, USGS Center for Earth Resources Observation Systems, Sioux Falls, SD

Mr. Meyer gave an overview of USGS services available to Tribal scientists as well as some examples of USGS/Tribal partnerships. His remarks follow:

USGS is a science agency. We don't do regulation. The agency is built around resource partnerships. I recommend that you use our web site as a resource. Note that there are a lot of interesting portals and websites for USGS information. I'm going to give you some of them, but there are a lot more that I won't have time to show here.

USGS on Tribal Lands

- Infrastructure Development
- Analytical tools for resource management

- Information infrastructure
- Workforce development
- Science Support and Technology Transfer
- Alternative energy
- Hazards assessment/mitigation
- Resource management
- Wildlife/biology
- Water quality/resources
- Synergies between Tribal/Federal programs
- USGS on Tribal Lands – Water
- Long standing partnerships with Tribes (& the EPA)

Programs

- Cooperative Water Projects
- National Streamflow Information
- Nat'l Water Quality Assessment (NAWQA)
- Toxic Substances
- Ground Water Resources
- Hydrologic Research & Development
- State Water Resource Research Inst.
- International Projects
- Water Information Coordination
- Water Information for Education

<http://water.usgs.gov/education>

National Water Information System (NWIS)

<http://waterdata.usgs.gov/nwis>

USGS on Tribal Lands - Biology

Home page

<http://biology.usgs.gov>

Nat'l Biological Information Infrastructure (NBII)

<http://www.nbii.gov>

Programs

- Bioinformatics
- Contaminant Biology
- Aquatic Ecosystems
- Fisheries/Aquatic Resources
- Invasive Species
- Status/Trends of Bio Resources
- Terrestrial/Endangered Wildlife
- Cooperative Research Units

USGS on Tribal Lands - Geology

Programs

- Earth Surface Processes
- Mineral Resources
- Earthquake/volcano Hazards
- Cooperative Geologic Mapping
- Energy Resources
- Coastal/Marine Geology

- Astrogeology
- Geomagnetism

Geology for Education

Ask-A-Geologist@usgs.gov

GEO-Data Explorer (GEODE)

<http://geode.usgs.gov>

USGS on Tribal Lands - Geography
Programs

- Land Remote Sensing
- Missions
- Data Preservation/Access
- Research & Applications
- Geographic Analysis and Modeling
- Science Impacts

Earth Explorer

<http://earthexplorer.usgs.gov>

Global Visualization Viewer

<http://glovis.usgs.gov>

Geography – Natural Hazards Support System

USGS on Tribal Lands – Geospatial Information

- National Spatial Data Infrastructure (NSDI)
- Coordinates USGS information holdings
- Coordinates with other Federal, State, Local & Tribal agencies
- Holdings: Geospatial One-Stop (geodata.gov)
- Standards: Federal Geographic Data Committee

The National Map:

<http://nationalmap.gov>

USGS Seamless Data Distribution System

<http://seamless.usgs.gov>

NAWQA and The National Map

USGS on Tribal Lands – Annual Reports

1997-2003 available online at www.usgs.gov/indian

2004 available from USGS booth outside (hardcopy or CDROM)

Contacts for USGS Native American liaisons at URL above (and on last slide)

USGS on Tribal Lands – Annual Reports

Searchable by:

- Tribal Organizations
- Events
- Reservation/State
- Activities:
- Resource/Environmental
- Education
- Technical Assistance
- Coordination/Policy
- Future Opportunities
- Sinte Gleska University Example: Infrastructure development

- Develop pilot projects between Universities, SGU, Rosebud Sioux Tribe & USGS
- Water/Biology/Geography disciplines
- Benefit to SGU & Rosebud communities
- Real world experiences for SGU students
- Develop spatial analysis lab at SGU
- Mapping/geospatial analysis tools/capabilities
- Training/internship opportunities
- Spatial database development
- Pilots:
 - Water quality
 - Invasive species/ethnobotany
 - Housing
 - Alternative energy (geothermal, wind, microhydro)

USGS operates the Landsat with NASA and has one of the largest image archives on earth. Earth Explorer has a broad range of data, not just imagery. Information and images available through these systems offer a wealth of data with many practical applications. Here are some examples I have done, primarily with northern plains tribes.

For instance, working with Landsat imagery of homes, road maps, and other geographic features, students created a map of their community; this sort of thing can be used to show the tribal council or the community how the underlying aquifer is affected by various things going on in the area. These kinds of images aren't necessarily representative of scientific studies but they are important as a tools for showing non-scientist what is going on. Here are some other exercises that turned out to be useful:

- A group in Fort Collins has a hand held technology they are using for species identification, in this case it is used for identifying medicinal plants on the Sioux Reservation.
- An intern worked at the housing authority in Rosebud to develop a housing database for the reservation which, like so many others was undercounted, one of the problems of relying on poor maps lacking house locations and other locational information.
- Wind generators cannot be visible from certain sacred sites but USGS can work with these technologies to help plan where to locate them. Other areas to look at are hydro-power or developing biomass fuel from switchgrass.
- Geothermal development can also be helped by use of some of our technologies. We found a "warm-spot" in SD, if you drill down 150 ft under rosebud you find water that's 150 degrees. Rosebud might be able to take advantage of this to heat buildings.

Grasslands may be the most altered environment on earth. One of the things USGS does a lot of is land cover management, generating data sets such as the Greenness Index. We did this on the Rosebud Sioux Reservation (Todd County). Tom Frederick, SGU rangeland manager, provided encouraging reviews for Antelope & Rosebud; quantitative validation showed warm and cool season grasses (and mixtures of the two). Sand hills and mesic-hydric areas represent ecosystems that are treated separately because satellite imagers respond differently to them. Some crops were showing as sand hills...this will be addressed with an improved crop map "non-range" mask derived from a combination of NLCD and Susan Maxwell's 2000-2001 crop maps of South Dakota.

The value of the satellite database that has been consistently processed and is provided by the USGS EROS Data Center as a standard product is what we want to show here. We also calculate a number of other measures from the NDVI (Normalized Difference Vegetation Index—aka "Greenness"). Including Percent of Average Seasonal Greenness that is a relative indicator of actual vegetation performance related to the mean performance for each 1-km pixel.

In order to integrate the satellite-derived vegetation measure (percentage of average seasonal greenness) with climate data (the Standardized Precipitation Index) and other useful environmental data sets, we use a data mining method known as regression tree modeling over 776 sites correlating to weather station locations. So the model output using the 1-km satellite greenness data provides more locally-specific information.

By knowing the ecological conditions necessary for the maintenance of specific pathogens in nature, one can use these characteristics to identify the spatial and temporal distribution of disease risk. In some cases, to investigate these questions, we utilize the principles of landscape epidemiology. The underlying premise of landscape epidemiology is that by knowing the geographic conditions necessary for the maintenance of specific pathogens in nature, one can use the landscape to identify the spatial and temporal distribution of disease risk.

We have begun research along these lines with scientists from the Division of Vector Borne Diseases, CDC, in Fort Collins, CO. We are beginning studies of three vector borne diseases: plague, Lyme disease, and LaCrosse encephalitis (one of four arboviruses found in the US). We are helping CDC in responding to the unexpected outbreak of West Nile encephalitis in the New York City area.

Geographic Spread of WNV

	1999	2000	2001	2002	2003
Avian	249	4305	7332	16741	11597
Vet	26	69	731	14571	4521
Mosquito	18	515	919	6604	7847
Human	62	21	66	4156	9100

Another vector borne arbovirus, Dengue Fever, is a major border health issue. This year 10-20 cases of dengue fever have occurred on the US side of the lower Rio Grande valley. This is a spillover effect of a major epidemic in Mexico, where thousands of cases have occurred.

Indigenous Knowledge Center for Education and Science Impacts (IKCE-SI) is another important source of data for Tribes. http://www.usgs.gov/science_impact/index.html

In Lakota – Ikce SI means “honoring the common person.” Sinte Gleska was awarded a five year grant with other awards going to MIT, Wharton, New Mexico State, and Prescott College. Sarah Wolfe (SGU) is Primary Investigator and John Goes-in-Center is consulting. Areas of study and program development include:

- How to utilize indigenous knowledge to better understand natural processes
- Social memory learning (“oral traditions”)
- Knowledge management (capturing knowledge in a retrievable manner)
- Decision support to tribal leaders (water resources, land use planning, ecosystem recovery, rangeland management), and
- Education and outreach (also to scientists, who have an opportunity to learn as well as teach).

USGS synergies enable Native Americans to succeed using USGS and NASA technology and innovative science and math educational programs. They can also provide decision support tools to tribal leaders for promoting economic development and managing tribal resources and create an innovative yet practical

model for uplifting Native American communities on a national scale including infrastructure development, resource management, career development, and research.

Rangeland management offers an example. Over the last 150 years, grasslands in the North Plains have been reduced to 40% of their original size. In the east – crops and pastures replaced native grasslands; in the west has been the introduction of “exotic” plants for/by cattle leading to profound disruption of Lakota lifeways. Often, management practices have adversely affected the abundance and distribution of species important to Lakota culture. How can we document the transition from original grasslands to the current system and articulate its impacts? Is it possible to restore indigenous ecosystems – such as bison ranges, for instance?

An integrated approach to rangeland management shows how to support economic development while maintaining cultural integrity. Ranching is an important economic activity, but typical commercial practices over the long term can reduce both range productivity and biodiversity. Alternative management practices have been shown to balance both economic and ecosystem viability. Reintroduction of bison on the North Plains also plays a role in grassland ecosystem recovery and restoration. Such practices are consistent with the Lakota belief in working within, not in spite of, natural systems. The following datasets were useful in developing plans for this program:

- National Land Cover Classification
- Seasonal Change over Rosebud (Landsat 2000)
- Rosebud Rangeland Productivity Mapping – Landsat 2000

A decision support framework utilized satellite observations, soils data, and meteorological data to observe past performance and predict future performance of grasslands. Climatic/meteorological influences were isolated from management influences and field data was collected in collaboration with Tribes, universities, and states.

The Coeur d'Alene Tribe has developed methods to get Bureau of Indian Affairs forest inventory information into the FIREMON database. Populating this database is one of the key steps to feeding data into the LANDFIRE remote sensing process. Providing LANDFIRE with accurate ground information will aid the LANDFIRE products to better represent actual ground conditions. The lessons learned at the Coeur d'Alene Tribe have the potential to be applied across other Tribal lands in the United States.

And, finally, USGS has archival imagery and maps -- aerial imagery dating back to the 1930's and maps dating back into the late 1800's. Cultural preservation is an important aspect of USGS archival programs. The Blue Cloud Abbey Image Archive contains thousands of archival and historical images of North Plains; silver plates have been scanned, restored, and printed in collaboration with Sisseton/Wahpeton Sioux Tribe. Again, I recommend you look at the website to see how much there is there. I've only given a few examples.

Questions and Answers

Q -- You showed geothermal energy potential and wind potential, has anybody put that together and compared with barrels of oil and such?

A -- Yes, they are doing that.

EPA Indian General Assistance Program (IGAP) Success Stories: Nikolski Drum Cleanup and Pauloff Harbor Quality Assurance Project Plans (QAPP), Battery Cleanup, and Sampling, Aleutian Islands, Alaska

Chris Riggio, Aleutian Pribilof Islands Association, Inc., Department of Community Services, Anchorage, AK

Mr. Riggio gave the following remarks.

This presentation covered two U.S. Environmental Protection Agency (EPA) Indian General Assistance Program (IGAP) success stories in the Aleutian Islands region of Alaska. These include two Aleut village sites: Pauloff Harbor Village on Sanak Island and Nikolski Village on Umnak Island. The Nikolski project consisted of a community and tribal cleanup of a drum site near the village. The project required working closely with their consultant, as well as with the U.S. Air Force, the Alaska Department of Environmental Conservation, and the Aleutian Pribilof Islands Association, Inc. (APIA) to complete the project successfully. This drum project was mostly completed during the summer and fall of 2005, but is still ongoing.

The Pauloff Harbor project was completed in May 2006 and involved the cleanup of over 2,000 pounds of old batteries in and around the village site. Analytical samples were also collected from several sites with suspected contaminants of concern, including a couple of possible former military sites. Work at this site was completed following an EPA-approved Quality Assurance Project Plan (QAPP). These projects highlight the cooperative efforts between various agencies and Tribes and also EPA IGAP projects of which the Tribes and EPA are very proud. These projects show that Tribes have tremendous capabilities to undertake such challenges when provided adequate funding, technical support, and assistance.

The Nikolski drum consolidation project was a community and tribal effort in collaboration with the U.S. Air Force (USAF), the Alaska Department of Environmental Conservation, and Aleutian Pribilof Islands Association, Inc. (APIA).

USAF site drums were removed a few years ago during an earlier cleanup of the old USAF military base, but some petroleum and other contaminants were left behind at this site. Various agencies and community members started to stockpile old vehicles, tanks, and drums adjacent to the USAF site. The community collected old drums from the village in an attempt to consolidate drums into one area and clean up the village. Some of the drums contained residual diesel fuel, while others contained some oily water, and others contained used oil. Ongoing releases were beginning to occur in this area from some of the drums. USAF and the State of Alaska Department of Environmental Conservation began to get very concerned about these ongoing releases and requested that the Tribe take appropriate action. Nikolski Tribe worked with agencies as well as EPA to address the problem using their EPA IGAP grant funds.

Cleanup work was conducted by Tribal members during summer of 2005 in conjunction with technical assistance from a consultant and involved agencies. The Tribe did most of the work with some assistance from a contractor and from us; they collected their own water samples for testing, used their own heavy equipment. We emphasized safety in operations – everyone on the job had authority to stop the project at any time if something unsafe was observed. It was made clear to everyone to follow correct procedures when handling petroleum fluids during operations in order to avoid an explosion, spill, or other dangerous situation! We had to think carefully about where to stage the disposal site, to be sure it wasn't too close to the shore, it had to be high enough so that years from now it wouldn't be in the water again.

The project followed a careful plan, according to the following steps:

- Work with EPA for approval to use IGAP funds for proposed work.

- Select contractor to assist in project (if desired).
- Contractor or Tribe write Project Plan.
- Submit plan to EPA and state regulatory agency for review and approval.
- Address review comments and complete final version of plan.
- Order materials for crew and project supplies (tyvek suits, gloves, goggles, liner materials, clean drums, etc.)
- Review plans with Tribal project team.
- Emphasize safety in completing work.
- Schedule project and coordinate with contractor for technical assistance.
- Contractor travel to site to assist team during project.
- Prepare area for lined containment cell.
- Ensure all equipment working properly.
- Consolidate like contents of drums into clean drums in containment area.
- Keep track of quantities and label drums as work completed.
- Triple-rinse drums prior to crushing; contain all rinsate to be treated in oil-water separator.
- Test drums of consolidated fluids and make sure drums within secured & lined containment area.
- Treat oily rinsates and oily waters through oil/water separator and scrubbers.
- Collect treated water, sample it, and hold in clean tanks until approval to release in accordance with approved plans.
- Recycle or dispose of old cut up drums, tanks, and vehicles.
- Move vehicles to containment cell one at a time; drain fluids out of engine, fuel tank, cylinders, transmission boxes, etc. and collect into drums.
- Clean vehicle fluid vessels and collect rinsate.
- Cut up & crush drums, tanks, and old vehicles once fluids drained and vessels cleaned.

Note that this list is not all-inclusive and is only a brief summary for this project. Other projects will probably be different, so it is always important to consider all the steps and requirements as unique. Working closely with EPA and other regulatory agencies to complete the project correctly is also important.

Lessons Learned

- Tribes are capable of doing a lot! This was a great example of a Tribe rising to the challenge with minimal expense.
- Address drum issues early so that such a problem is not created.
- Work with EPA and other agencies if you have unresolved issues with petroleum products (drums, used oil, old tanks, etc.)
- Reach out for help from agencies and consultants to solve such problems early before they create a big messy oil spill.
- Be brave and ask for help on environmental problems.
- Working together is key – set aside your differences with agencies and other community members and solve the problem. A lot of good can come out of it!

The Pauloff Harbor QAPP, Battery Cleanup, and Sampling Project was another clean-up project we worked on in the Aleutians. There are several hundred Aleut archaeological sites on Sanak and Caton Islands, dating back to at least 3,000 years ago, and likely to approximately 9,000 years ago. The islands were heavily populated by Aleuts prior to first contact with Russians.

Two Aleut villages on Sanak Island that were busy cod fishing stations around 1909 were the Pauloff Harbor and Sanak Villages. The island also had an active cattle ranch, slaughterhouse, and meat packaging facility up until around 1953. During WWII, Sanak Island became an important military outpost supporting the war effort in the North Pacific. Sanak had both an Army Aircraft Warning Station and a Navy Radio Relay Station (1943-1946). At their largest, the bases had over 300 persons, then were abandoned after end of war.

The villages were abandoned in the early 1970s and a herd of Scottish highlander cattle was established. A lot of tribal members who grew up on the abandoned sites live elsewhere now, usually in the larger cities, but some of the tribal members are hoping to move back to these villages; considering the price of fuel and problems in the fisheries, things changing, probably from climate change, and salmon farming, it's going to be difficult.

Currently the island is used for subsistence food gathering by Aleuts and others living in the region. These are very rich in subsistence food resources:

- Duck and feral cattle hunting.
- Fishing for halibut, salmon, trout, and cod.
- Gathering of seagull eggs, urchin, baidarki (chiton), clams, and other shellfish.

Foods support economic, physical, cultural, and spiritual well-being of Aleuts and others in region. Concerns were raised by the Tribe about the effects of old drums, batteries, and former military sites on the health of the island and subsistence resources. Investigations of some sites were done, but cleanup work was limited. Some of the military sites were listed as "No Further Action" by the U.S. Army Corps of Engineers.

The Pauloff Harbor Tribe decided to start a site investigation and conduct some cleanup of batteries, drums, and main environmental hazards using EPA IGAP grant funds. Also, they conducted an investigation of a possible former military dump site. The Tribe worked with the U.S. Army Corps of Engineers to address the site if it was determined to be part of the old military site and if contaminants of concern were present. Site visits were conducted in 2003 and 2004 for planning of future work.

A Quality Assurance Project Plan (QAPP) was completed during 2004-2005 for completing battery cleanup and soil sampling. The Tribe worked closely with US EPA for review of draft versions of the QAPP, forwarding information to the U.S. Army Corps of Engineers to keep them involved.

Approximately 2 months of preparations and planning were done before conducting field work. We took lots of photos and lots of notes because it really helps; we also spent a lot of time interviewing people and the elders, especially about their history. A lot of tribal members come across these forgotten sites when they are out fishing so we are trying to use this information to update lists. We can't just go digging into an old military dump site because there is always the risk of coming across unexploded ordinance, which we have a lot of in the Aleutians.

The focus of the project was to get these batteries out. A lot of them were broken open. Broken batteries had to be containerized (so that wind wouldn't spread dust all over), wrapped, taped, and put into contractor bags. We expected to get about 100 lbs and ended taking out over 200 lbs, a lot of which are now being recycled.

Lessons Learned

- Stay closely involved with various agencies – they can help provide technical and maybe even financial support.
- Work cooperatively with various parties.
- Plan on collecting good field information during early site visits in order to write QAPP & to prepare for field work.
- Collect GPS coordinates & lots of digital photos during early site visits.
- Take plenty of notes in the field.
- Interview several people who know site history.
- Plan on lots of time to write QAPP, to allow time for reviews, and to address comments.
- Sometimes it takes patience and perseverance to get the QAPP done! However, a good plan pays off in the field.
- Allow plenty of time (several months) for:
 - planning and preparing for field efforts.
 - coordinating with laboratories (if samples collected).
 - ordering, purchasing, and shipping supplies, and getting gear in order.
- Be sure to write and follow a Health & Safety Plan.
- Allow time for reviewing field plans and training people for field work.
- Plan field work to occur in the best season.
- Make sure all field team members have proper training far in advance of field work (HAZWOPER 40-hour, First Aid/CPR, etc.)
- Have extra supplies and materials on hand for field work.
- Ensure you are prepared for the unexpected and to address any emergencies – there might not be a hospital nearby.
- Consider renting a satellite phone.
- Set up contracts for technical support and assistance, if needed.

Questions and Answers

Q -- Are you planning to recycle that scrap metal?

A -- For now we're just cutting it up and burying it all in a pile. We're hoping to find a buyer for it at some point.

Q -- Having performed the site assessment and monitoring under the GAP program are the tribes planning to get the military to open these sites for clean up?

A -- Yes, the Air Force does plan to come back out; concerns were raised to their legal department, but we didn't want to waste time and money arguing. The state of Alaska was really helpful in getting various parties involved in getting the clean up done. With the Corp of Engineers, there's a problem because of budget cuts.

1 P.M., CULTURE AND COMMUNITY HEALTH

Facilitators:

Michael Callahan and Richard Janssen

Quinault Indian Nation Development of Tribal Seafood Consumption Survey Software (RARE)

Lon Kissinger, US EPA Region 10, Office of Environmental Assessment, Seattle, WA

Anna Towksjhea, Quinault Indian Nation, Taholah, WA

Samuel Iwenofu, Quinault Indian Nation, Department of Environmental Protection, Taholah, WA

Data from past fish consumption surveys in the Pacific Northwest, 1994 to 2000, show that Tribes consume much more fish than the general U.S. population at 20 grams/day. The Squamish Tribe in 2000 was consuming 214 grams/day, the Squaxin Island Tribe 76 grams/day, the Tulalip Tribe 73 grams/day, and the Columbia River Intertribal Fish Commission 59 grams/day. The EPA recommended general fish consumption value is 17.5 grams/day.

More data on fish consumption are needed to support health and regulatory needs, to compare consumption between Tribes, to evaluate and examine differences between Tribes culturally and environmentally that affect consumption rates, and to examine relationships between body weight/gender/income/age and consumption. In developing a tool to leverage experience gained in earlier surveys to enable Tribes to retain custody of their data and provide a user-friendly, standardized format, the Computer Assisted Personal Interview (CAPI) based on MS Access was used.

Funding was obtained for the pilot study from the Regional Applied Research Effort (RARE) and NHEERL from 2003 to 2006. EPA Region 10, NHEERL, and Westat partnered to develop a Squamish survey-based CAPI in MS Access. In early 2006 the CAPI was updated and a user's guide and training manual were completed. The Quinault Tribe reviewed the software and participated in pilot testing and software customization. Westat finalized revisions based on the pilot test and a Quinault acceptance survey in June. There is the possibility of added funding in 2006.

Issues with surveys and CAPIs include the fact that current seafood consumption rates are suppressed (lower than the Tribal ideal for consumption or original consumption rates). CAPI may not be consistent with the narrative story-telling approach common to Tribes, and may not capture qualitative impacts of contamination on Tribal cultures and life ways. Tribal elders may not be comfortable with the CAPI format, and program modifications are expensive.

Using CAPI, however, information can be obtained on the consumption of species groups and individual species of fish and shellfish for a 24-hour recall period, a yearly in and out-of-season period and throughout the year for adults and children, including methods of preparation, portions consumed and parts of organisms consumed. Information is also obtained on the sources of seafood (restaurant vs. home), harvest locations, time-sensitive factors, interviewee history, and demographics. The quality of the interview is also maintained and cooperation and reliability fostered.

Software components include a set-up or "supervisor module" with a configuration for each Nation, a species library, and the ability for deployment by USB drive onto the interviewer's PC, allowing the accumulation of data from multiple sites onto the supervisor's master version. A reporting module provides six statistical reports and query options are available. Seafood portion photographs are used also to accurately depict cooked preparations and are easily transportable for the interview sessions.

Individual configuration set-up screens allow the development of underlying database tables to customize the CAPI to interview members of a particular Tribe. Information can be tabulated in a number of ways, for example, to define species and groups of species based on feeding levels and sites in the water where different levels of contamination can exist. The number of days and seasons are used to compute

consumption rates. The types of preparations and sizes of portions associated with different species can be tabulated. Parts of shellfish consumed are associated with species type as well as catch and harvest locations.

Interview questions for adults include the following:

- A CAPI introduction
- 24-hour recall of species and species group consumed
- Where the fish was prepared and how much was consumed
- Seasonal consumption rates vs. the rest of the year, and
- Parts of finfish consumed, sources of seafood and harvest location.

The software won't allow questions to be skipped, and contains out of range error checking, data entry verification, and the ability to annotate responses.

Interview questions regarding consumption rates for children under age six include the following:

- The age, gender and number of children
- Weight and height of each child
- Whether the child was breastfed and duration
- Whether the child eats seafood and when consumption began
- Whether the interviewee was present for meals with children
- Who prepares children's fish/shellfish and how much/how often it was consumed, and
- What parts of the fish/shellfish were consumed.

Changes in consumption can be tabulated, as well as the reasons for change. Some questions relate to consumption at Tribal gatherings and overall demographics. Reports are generated using simple statistics showing the mean annual grams per person (raw weight) consumed per kg body weight per day, standard deviation, and variance. Consumption rate reports are also generated by species for the 24-hour recall period and seasonal/annual timeframe for each Tribe. Overall consumption rate percentiles are generated for each Tribe.

Why did the Quinault participate in the study? The Nation recognized that determining seafood consumption rates was important in the development of scientifically defensible Reservation water quality standards for the Tribe and EPA. Because Tribal members consume more seafood than the general public, more stringent water quality standards may be needed to protect community health.

The CAPI was pilot tested to train interviewers in consistent data collection and interviewing methods, determine how well the survey works with different Tribes, especially people aged 50 to 65, and to modify the survey based on pilot results. Researchers prepared for the pilot test by consulting with Tribal members and fisheries biologists regarding consumption and preparation methods, and the development of harvest area maps. They also identified people to interview and selected the interviewers in consultation with the Tribal leaders.

Results of the pilot test allowed the program flow and supporting materials to be modified. The survey was found to be easy to use and Tribal elders were comfortable with CAPI as long as they were interviewed by Tribal members. Interviewees felt that the survey accurately captured Quinault seafood consumption. Thus, the software could be used for a full-scale Quinault Nation survey.

Next Steps

- Conduct full scale Quinault Nation survey using CAPI

- Seek potential additional funding for final upgrades and revisions
- Test with another Tribe for validation of flexibility, and
- Make the instrument available for use by other Tribes.

Questions and Answers

Q – Did any Tribal members find the interview insulting?

A – A Tribal member supervised the interviewer for the pilot study. Tribal members also realized that the information is important to set water quality standards for health and the protection of their seafood consumption culture. They are the first Coastal Tribe to be surveyed. Also, interviewers were trained to get the true voice of the people in their interviews and at Tribal gatherings. EPA ensured the quality of the questions for validity. The Tribal members helped to customize the CAPI to their experiences and used species names that were common to the Nation. They ensured that pictures of the foods were accurate. Tribal members conveyed how important the fishing industry is for economic viability of the group.

Q – Why did the Quinault get involved in the study?

A – They want to ensure that adequate water quality standards are developed and that artificially suppressed rates of consumption are not inappropriately used for policy. Tribes want to look at how much their people want to consume, not just rely on standards that have been set after waters have been contaminated.

Q – Does the EPA value collecting historic rates and is that information available?

A – Yes. The Squamish Tribe has a more historical context with their water and groundwater resources and their rate of seafood consumption.

Cultural Science and the Twenty-Nine Palms Tribe: A Native Paradigm

Clifford Trafzer, Twenty-Nine Palms Band of Mission Indians, Environmental Protection Agency, Yucaipa, CA

Anthony Madrigal, Twenty-Nine Palms Band of Mission Indians, Tribal Environmental Protection Agency, Coachella, CA

Dr. Willard Gilbert, Northern Arizona University, Twenty-nine Palms Band of Mission Indians, Tribal Environmental Protection Agency, Flagstaff, AZ

In 2005 the Tribal EPA of the Twenty-Nine Palms Band of Mission Indians in California began a project to develop a model for the inclusion of Native cultural science into western science and current EPA risk assessment paradigms for a more elective, holistic, and inclusive form of health and environmental decision-making in the context of the current global ecological crisis. The Tribe resides in southern CA near the Mexican border.

The process started with cultural interviews in which Tribal members asked questions about changes over time, plants and medicines, trails, and springs to develop a general model so that problems could be addressed as they arise. Tribal health and environmental concerns, ideas, knowledge, and values were needed as a baseline. Cultural science is often found in stories and is sometimes revealed in dreams and in communication with spirit beings. It is knowledge of the world, not just superstition, but not compartmentalized like western science.

Direct experience with the natural world reveals to the Native people that all things are animate, possessing a spiritual power and a creative energy in a living, inter-related, and evolving universe. Tribal

traditional practices and knowledge have guided traditional land management of wild resources and practices such as tilling, pruning, finding water, and knowing what seeds to sow and plants to eat and use for medicine. Tribal elders hold this knowledge as well as understanding of how the environment has changed over time.

For example, a virus was killing people in the Four Corners area of Arizona. The Tribe and CDC worked together to integrate their forms of science and find a cause. Native people told CDC that it had been a wet year with a lot of pinion nuts produced, which were being eaten by rodents, which in turn were found to be passing on a virus to humans. Tribes have a tremendous store of knowledge about the environment learned over thousands of years.

These “ways of knowing” are important to bring to children in the classroom and are being incorporated into a new curriculum by the Tribe. When this was done, their scores in western science tests went up, ensuring more math and science careers for Tribal children. People think that the Indians left the environment alone, but they actually interacted with the environment by tilling and planting seeds and managing burns to ensure the food supply. But our environment has changed in many ways.

Before the 1930s there were plentiful tortoise populations along the Colorado River and many rabbits. After the water table dropped from impoundments, these species nearly disappeared. In the 1950s soldiers training for Korea shot the deer along the river. The valley had lots of mesquite trees and small animals, but when cattle ranching changed to farming after World War II and pesticides were used, there was a major change in the fish in the Colorado River. We don’t eat the mesquite beans on the Reservation anymore because of pesticides. We have learned all this through oral interviews.

As we gather knowledge, we have developed a model for use by the Tribal Environmental Office. We have established a Tribal Cultural & Resources Committee to consult with the Tribal EPA. It draws on Tribal cultural science experts, elders, members and special projects. This knowledge is used to determine impacts of river dredging on the Reservation, and to set beneficial uses of the water. Tribal science gives more specificity in addressing a problem.

A year-long consultation process has prompted the EPA and the Tribal EPA to support cultural science through targeted funding. Specific projects that could begin with the consultation process include the dredging of the Whitewater River, pollution in the Colorado River, habitat loss and issues of diet and consumption. Regarding dredging, elders will be consulted about the impact on plants that are used for medicines and making baskets.

GIS mapping is used to depict areas for collection of data after implementation of the consultative model for integration of cultural science. The consultations between the Tribal EPA and EPA allow access to and sharing of all information, an opportunity for mutual education on EPA risk assessment protocols and Tribal values, mutual respect for each other’s views, and to build support for funding the consultation process.

Comments

Comment – Canada accepts Tribal oral history in its Court of Claims, but the U.S. does not. The United Nations accepts our traditional oral history. Regarding sovereignty and intellectual property rights, Tribes fight the same battles year after year. The Supreme Court says Alaskan Natives are not Indian. Tribes need an intellectual property rights ordinance regarding the biological and scientific taking of DNA information from them. The next conference should be on Bio-Propecting.

Comment – Natives look at everything as being alive. There is a story about the close relationship between hunting, whales, and humans. A man on the north slope of Alaska's body is in an igloo but his spirit has departed. It has joined the whales who taught him that the whalers would be coming. As a whale he could share his meat with the widows and elders or give up his life and come back as a duck. He became a duck, flew back, and became a human again.

Comment – There are many sacred things that the elders won't share with others. They are recorded inside one's spirit. I was taught to only speak the sacred language to other Tribal members, but we are all affected by environmental problems. I have come to find out why our fish and clams are contaminated. I am here to listen and learn. Maybe some good will come out of it.

1 P.M., TRAINING: OVERVIEW: QUALITY ASSURANCE TOOLS – QUALITY ASSURANCE PROJECT PLAN (QAPP) DEVELOPMENT TOOL

Facilitator:

Elizabeth Jackson

This two-part session provided an overview of two currently available tools specifically designed to assist tribes in understanding Quality Assurance (QA) guidance and in developing QAPPs. These tools, the Quality Assurance Project Plan (QAPP) Development Tool and Turbo QAPP, were developed to address difficulties tribes encounter in the following areas: limited experience with the EPA QA system and requirements, QA guidance not tribe-friendly, inconsistency in EPA regional requirements and reviews, long, difficult and resource-intensive review processes, and lack of tribe-friendly QA training.

Quality Assurance Project Plan (QAPP) Development Tool

David Taylor

David Taylor, US EPA Region 9, one of the key developers of the QAPP Development Tool, walked through various modules contained on a CD-ROM disk, which is focused on developing QAPPs for water monitoring projects. Melinda Ronca-Battista from the Tribal Air Management Support Center (TAMS) provided an overview of Turbo QAPP, which focuses on simplifying QAPP development for air monitoring projects. Turbo QAPP was developed as a means of guiding tribes through the QAPP development process by prompting users to enter information at specific points in the process, similar to the concept of Turbo Tax for filing taxes - and generates a full QAPP based upon the information entered. Both tools provide a user-friendly tool for creating QAPPs.

All session participants received copies of Turbo QAPP and the QAPP Development Tool. For additional information or a copy of the CD ROM tool for tribes to use in preparing Quality Assurance Plans, send email to taylor.david@epa.gov.

1 P.M., TRAINING: OVERVIEW OF WATER QUALITY STANDARDS FROM A TRIBAL PERSPECTIVE

Facilitator:

Nancy Schuldt

Criteria Development

Nancy Schuldt, Fond du Lac Reservation, Environmental Program, Cloquet, MN

Daniel Mosley, Pyramid Lake Paiute Tribe, Environmental Department, Nixon, NV

Margaret Watkins, Grand Portage Reservation, Environment Department, Grand Portage, MN

Nancy introduced the topic of criteria development, using an abbreviated presentation from the tribal water quality standards academy to cover the key concepts. States and tribes must adopt criteria that protect the designated use, and:

- Must be based on sound scientific rationale
- Must contain sufficient parameters or constituents to protect designated use, and
- Must support the most sensitive use.

Criteria can be narrative, as in the “free from” statements often used in WQS documents, or they can be numeric, derived from EPA guidance or other scientifically defensible methods. There are five broad categories of criteria: human health, biological, nutrient, bacteriological, and aquatic life.

Dan Mosely gave a case study on the PLPT experience in developing biological criteria for their tribal waters. Their first step was identifying stressors:

- Point source: Waste Water Treatment Plant
- Nonpoint Sources: North-Tahoe Drain, Steamboat Creek, urban storm water runoff, and GW return flows back into the river.
- Diversion Dams: Lower lake levels, increase TDS
- Exotic Species: Non-native salmonids (Rainbow trout) compete and hybridize with native Lahontan Cutthroat trout (LCT). Brown and Rainbow trout are more aggressive, and effectively compete with LCT. Tall Whitetop, purpleloose strife, and the aquatic Eurasian watermilfoil are competing with native plants.

PLPT initially submitted a narrative statement regarding protection of biological communities and populations, then developed numerical criteria (temperature, dissolved oxygen, ammonia, and mercury) for protection of fish populations and human health. PLPT then began the process of monitoring benthic organisms for purposes of developing an IBI (Index of Biological Integrity) for the Lower Truckee River, working closely with contractors and regional agency partners, and utilizing EPA guidance. Reference sites were selected, and four core metrics were used for their IBI: taxa richness, % EPT taxa, % tolerant individuals, and % dominant taxa. This IBI is particularly responsive to wet and dry years. The PLPT is also refining aquatic life uses under the “TALU” framework, with biological condition and human disturbance gradients identified. PLPT plans to continue its bioassessment program on streams and wetlands, and ultimately develop IBI’s for those waterbody types.

Margaret Watkins then presented a case study on Grand Portage’s process of developing bacteriological criteria for coastal and inland waters on the Grand Portage Reservation. Most primary contact recreational use on Grand Portage is along Lake Superior; only one inland lake is used for swimming, because inland lakes are commonly highly colored, with mucky bottoms and substantial littoral vegetation.

The federal Clean Water Act requires that all waterbodies have “primary contact recreational” as one of their beneficial uses. Without being required to conduct a use attainability analyses (UAA), the only way the Tribe can have water bodies designated for only secondary contact recreation is to apply bacteriological criteria sufficient to support primary contact recreation. Although primary contact recreation may not be occurring in wetlands, EPA still requires the designated use to be assigned to wetlands as well.

Grand Portage had several options to deal with this inconsistency between natural condition and suitability for primary contact recreational use. Primary contact recreational use is divided into subcategories based upon frequency of use: high, moderate, or infrequent. Numerical criteria in for *E. coli* in Grand Portage’s WQS vary according to the intensity of use for swimming.

Implementation

Rick Gitar, Fond du Lac Reservation, Office of Water Protection, Cloquet, MN

Margaret Watkins, Grand Portage Reservation, Environment Department, Grand Portage, MN

Rick Gitar presented a case study on the Fond du Lac Band's framework for implementing their WQS through §401 certification. Tribes have this authority once their WQS have been reviewed and approved by EPA, but can choose one of two routes: EPA can process the 401 certification using the tribe's WQS, or the tribe can process the 401 certification themselves. Fond du Lac opted to develop its own process for 401 certification, which applies to any federal permit for an activity with the potential to affect water quality: i.e., CWA 402 (NPDES), CWA 404 (Wetland fill – US Army Corps of Engineers), or FERC.

The applicant must provide all pertinent information (defined in Fond du Lac's process), and the Fond du Lac Environmental Program provides the administrative review of the application. This review includes a 30-day public comment period, after which a decision recommendation is made by Environmental Program staff. The application is reviewed for compliance with applicable federal regulations, tribal water quality standards, and any other applicable tribal regulations. The decision recommendation can be certification, certification with conditions, or denial, and is signed by the Director of the Resource Management Division. An appeals process is also defined, after which the Fond du Lac Reservation Business Committee (the governing body) has the authority to make a binding decision.

Margaret Watkins gave a presentation on the Grand Portage Band's Cooperative Agreement with the state of Minnesota for a specific area of Lake Superior. The Cooperative Agreement formally recognized a small portion of Lake Superior historically and currently used by tribal members. (Many Band members drink the water from Lake Superior bays without treatment because groundwater quality is poor and treated water from the community system is not available because of distance.) The Cooperative Agreement established a process by which the Band and MPCA would work cooperatively to plan and administer independently adopted water quality standards for the portion of Lake Superior referred to as the Grand Portage Zone. It also developed procedures for joint implementation of water quality standards including the designation of an area as a No Discharge Zone in both the Minnesota and Grand Portage WQS.

The Preservation Zone of the Land Use Ordinance is adjacent to a No Discharge Zone in the waters of the Grand Portage Zone of Lake Superior. The Preservation Zone in the Land Use Ordinance and the No Discharge Zone of the WQS protect an area that includes pictographs, Pukaskwa Pits, Little Cedar Spirit Tree (Witch Tree) that is listed on the National Registry of Historic sites, and the community drinking water intake. The Preservation Zone also protects rare and medicinal plants and their habitats, an archipelago of islands with rare vegetation, and threatened and endangered species.

The Grand Portage Land Use Ordinance and Water Quality Standards work together to assure that both the land and waters are given equal protection for similar use designations. The use designations for both land and water within the Reservation reflect Grand Portage cultural and social values.

3 P.M., EARTH

Facilitators:

Michael Callahan and Richard Janssen

Tribal Emergency Management

A.J. Fisher, Director, Tribal Homeland Security & Emergency Management Program, DSD Laboratories, Security Systems Division, Montgomery, AL

Ms. Fisher works in a government advocacy role with DSD. She helps Tribes interface with state and federal governments to comply with regulations and ensure funding for homeland security needs. States prefer to dictate the terms with which they will interface with Tribes, but it must be the reverse to best represent Tribal needs.

Under the Homeland Security Act of 2002, Ms. Fisher effectively works to have states work closely with Tribes as local governments, which allows them to apply directly to the state for funding rather than first having to go through other local governments. Subsequent provisions of the Act passed in 2004 identify Tribes as applicants to the Department of Homeland Security (DHS). But Tribes must have a plan approved to apply for the grant funding. So the start-up money to develop a plan is committed to be spent by Tribes on their own behalf.

In South Dakota, DSD helped Tribes become directly funded by the state. DSD also has identified two Tribes for a special grant program. Recently, DSD also advocated at the federal level for planning and training funding to be made available in addition to structural or equipment funding. Each Tribe should identify a person or attorney to be educated in this process. There has been about \$4 billion identified by the Department of Homeland Security for Tribes to access. In one case, the Fondulac Tribe north of the Twin Cities, MN, wasn't able to obtain any funding.

In general, DSD Laboratories provides professional homeland security and emergency management planning services to Tribal governments to assist in the design, implementation, and management of a comprehensive program consistent with complex federal compliance measures. As a governmental advocate, DSD is unique in providing coordination for Tribes at all levels with the Department of Defense, DHS, and other federal agencies and departments that affect Tribal governments' homeland security responsibilities.

There are over 100 grant programs that are directly or indirectly related to homeland security. DSD works to ensure compliance and eligibility for future grants for Tribes. DSD prepares grant applications on the Tribe's behalf at no cost. When a grant is received, DSD implements the grant requirements and assists the Tribe in grant reporting requirements.

Under federal laws and directives, DSD also prepares All-Hazard Emergency Operations Plans (EOP) and National Incident Management System (NIMS) Plans, and handles training, assists with emergency management accreditation program (EMAP) compliance, interoperable communications for first responders, emergency operations center (EOC) planning, FEMA hazard mitigation and FEMA flood mitigation planning, fire mitigation planning, and hazardous material emergency preparedness planning.

DSD also assists Tribes with environmental emergency preparedness planning, bioterrorism/biohazard preparedness planning, chemical/biological/radiological/nuclear and explosives (CBRNE) preparedness, critical infrastructure protection hardening and strengthening, tribal homeland security strategy planning, continuity of operations (COOP)/continuity of government (GOP) planning, mutual aid agreement planning, training in weapons of mass destruction/hazardous material/first responder/CERT, and exercise planning and validation using a holistic all-hazards approach.

DSD first prepares a "crosswalk" between Tribal policies and applicable federal and state statutes, regulations, directives, policies and guidelines to determine the necessary course of action to achieve and

maintain DHS compliance. Existing gaps in policy, programs and strategies are identified. Funding sources are identified to mitigate the gaps. A Tribal Homeland Security and Emergency Preparedness Strategy is developed that quantifies needs, mitigates deficiencies and reinforces the capability to prevent and respond to weapons of mass destruction (WMD), natural disasters and acts of terrorism. Effective remediation and recovery efforts are also delineated throughout the entire threat spectrum.

For more information on DSD, contact A. J. Fisher at 318/344-6997 or email afisher@dsdlabs.com

Overview of National Incident Management System (NIMS)

Stacy Eich, Senior Tribal Emergency Management Planning Coordinator, DSD Laboratories, Security Systems Division, Montgomery, AL

In March 2004, the Secretary of Homeland Security, at the request of President Bush, released the National Incident Management System (NIMS), a comprehensive system to improve Tribal, state and local response operations using the Incident Command System (ICS) and the application of standard procedures and preparedness measures. Directive 5 required federal departments and agencies to adopt and Tribes and other local and state jurisdictions to fully implement NIMS to remain eligible for federal preparedness funding.

To be compliant with NIMS, Tribes, states and local governments were required to complete several activities by September 30, 2006. Tribes, like other government entities, must prevent, respond to and recover from emergencies and disasters to preserve life and property in the community. All emergency incident responders must work together to comply with NIMS.

Criteria to receive follow-up preparedness funding for FY07 includes complying first with the FY05 requirements, including the following:

- Completing the NIMS Awareness Course, an independent study on the Emergency Management Institute (EMI) web page at: <http://training.fema.gov/EMIWeb/IS/is700.asp>
- Formally recognizing the NIMS and adopting NIMS principles and procedures by adopting ordinances or legislation at <http://www.fema.gov/nims>
- Determining which NIMS requirements have already been met and using DHS grant programs to fill gaps
- Developing a strategy and timeframe for full NIMS implementation during FY05--full compliance is required by FY07 for assistance, and
- Institutionalizing use of the Incident Command System (ICS).

FY06 NIMS compliance activities include the following:

- Adopting NIMS at all local governmental departments and agencies and private emergency sectors
- Managing all emergency incidents and preplanned events in accordance with ICS
- Carrying out and supporting emergency incident and event management through multi-agency coordination
- Communicating timely information to the public during an incident through a Joint Information System and Joint Information Center.

There are 22 compliance measures for FY06. For a more detailed list, go to <http://www.fema.gov/nims>.

As of August 2005, the federal government had compiled a list of departments and emergency preparedness grants that were available through the EPA, Departments of Agriculture, Justice, Education, Interior, Health and Human Services, Homeland Security, Energy, and Transportation; the Nuclear

Regulatory Commission and the Tennessee Valley Authority. For more information, contact Stacy Eich at 910/245-1976 or email seich@dsdlabs.com.

Questions and Answers

Q – When asked, the State of MN said that Tribes are cities, but now only one Tribe in the state gets funding.

A – There is a pass-through distribution procedure that defines how states allocate dollars. According to the regulations, if one Tribe gets Homeland Security money, then all the Tribes should get it.

Q – Can Tribes get information about how a law passed affects their homeland security?

A – Contact your state Homeland Security coordinator and get a strong advocate for the Tribe.

Comment – We have a Tribal liaison from FEMA, but they are not supportive. In California, no funding has been secured for the Tribes – even if it's money going back to the federal government unused.

A – We're seeing some progress working with states. Homeland Security agrees with us (DSD) regarding the definition of Tribes. But reporting from the states about needs for Tribal funding isn't always accurate. A Tribal advocate must educate each state about how it is supposed to work through the system. Even though very few Tribes have gotten money, the states do not report a problem to Homeland Security. We still need legislation that provides direct funding to Tribes.

Q – Homeland Security is an important part of a healthy environment. How can we help be your voice? Not many Tribes even know that October 1 is a deadline that needs to be met.

A – Six of nine Tribes in South Dakota don't know what NIMS is as of 9/27/06.

Comment – Agencies need to work smart and communicate laterally among themselves. Tribal involvement is needed. The U.S. Forest Service has gained trust among Tribes. Perhaps we can work with them.

A – We need a National Tribal Homeland Security Commission. In South Dakota, DHS is supportive of Tribes forming coalitions. The Tribes must unify.

Q – How do we find an advocate?

A – You can outsource it. Tribes can call at no cost. There is an emergency performance grant available to support a Tribal committee and a manager for emergencies.

Q – Can the federal government extend the deadline?

A – DSD has talked with the DHS and FEMA about this, and our Tribes have gotten an agreement from the federal government that they can show a "good faith effort" to the state and still receive their grants. A problem has been that you have to be in compliance first to apply for a grant to do emergency preparedness planning. A government advocate can intervene for you to put together an implementation strategy.

Q – If a Tribe is not compliant on October 1, 2006, will that affect FEMA hazard mitigation funding also?

A – Yes, noncompliance will affect that funding. FEMA provides some funding for planning purposes, and you don't have to go through the states to obtain it. You can go directly to FEMA. You have a better chance of getting a grant this way even though you're competing with all the other states. FEMA will offer a minimum amount of money, but you can negotiate and get a higher level.

Comment – There was an extension given on a May 2005 deadline. All Tribes need an All-Hazards Mitigation Plan. If you have this, there are four grant programs you can apply for under FEMA. (With a show of hands, only one Tribe in the audience had this grant.) Hire a consultant.

Comment – We had a clean water plan that the federal government wanted us to change. We fought it and won. But most Tribes don't know about regulations and how to access planning funds.

Comment – Tribes were invited to attend the FEMA hazard mitigation planning. Only two people came. And FEMA didn't talk about NIMS training during their training. We needed to know six months ago that this deadline was coming. (Many in the audience had indicated that they weren't aware of the deadline.)

3 P.M., TRIBAL DIET AND COMMUNITY HEALTH

Facilitators:

Roland Hemmett and David Nelson

Tribal Food Safety Initiative

John Persell, Leech Lake Band of Chippewa Indians, Division of Resources Management, Cass Lake, MN

As part of a Tribal food safety initiative, a cooperative fish and wildlife monitoring program was initiated in 1999 through the Environmental Quality Departments of seven Tribes: the Minnesota Chippewa, Leech Lake Band of Ojibwe, Little River Band of Ottawa Indians, Mille Lacs Band of Ojibwe, Turtle Mountain Chippewa, Grand Portage Chippewa, and the White Earth Chippewa. The overall research, monitoring, and data quality objectives focused on the development of a Tribal Food Consumption Guide.

Approximately 1,171 fish of several Tribally utilized species were collected from 30 lakes. Of these, 905 fish were analyzed for mercury and 266 fish, including subsamples of liver and egg tissues, were analyzed for previously screened organic chemicals of concern such as dioxins/furans, polychlorinated biphenyls, and DDT. Deer, moose, duck, turtle, bear, and wild turkey tissues also were assessed.

The Minnesota Chippewa Tribe (MCT) began fish mercury research in 1992. They examined a variety of food sources common in the traditional diet to explore the risk associated with such consumption:

- Fish
- Waterfowl
- Deer, moose, bear
- Herbs and medicines

Can Tribal governments best balance food consumption benefit and risk by considering both western science and traditional knowledge? MCT's current initiative takes this approach. Mercury research began in 1992; assessment of food contaminants other than mercury began with literature review in 1996. Contaminant research in foods is generally based on average American exposure scenarios. FDA recognition of developmental impacts in the recent adoption of mercury is reluctantly following a State/Tribal lead. US FDA conducts some monitoring of commercial foods and USEPA, States, and Tribes assess wild fish and game. In 2003, the National Academies Institute of Medicine published "Dioxin and Dioxin-like Compounds in the Food Supply." Some Canadian and other international data exists regarding wild and commercial food contaminants.

There is a paucity of data usable for a comprehensive Tribal food guide so the Tribe would have to do its own research. However, Canadian research identified burbot (*Lota lota*) liver as a valuable screening

tool. In 1998 funding was identified and US EPA approved a QAPP prepared for a screening study using methods 1613b (D/F), 1668a (PCBs) and 8081b for OC pesticides. Burbot liver was collected and analyzed in 1999.

Screening study results showed that discrete samples were preferred as composite results have greater potential for variance from the mean; the EPA Columbia River Study of 2002 showed up to 70 percent variance from side to side. Both burbot muscle and liver were analyzed as discrete samples from five Mille Lacs Lake burbot and samples showed the following results:

- Average muscle D/F = 0.10 pg/g TEQ (ND = 0)
- Average liver D/F = 2.8 pg/g TEQ (ND = 0)
- Average muscle PCBs = 0.18 pg/g TEQ
- Average liver PCBs = 14.3 pg/g TEQ
- Average muscle DDT = 9 ppb
- Average liver DDT = 379 ppb

MCT's discrete analyses included the following:

- 905 fish muscle: mercury
- 276 fish tissue organic analyses: muscle, liver, eggs (30 lakes)
- 10 deer tissue organic analyses: muscle and liver
- 10 duck muscle, liver: organics
- 14 snapping turtle: mercury
- 2 moose muscle, liver: organics
- 1 bear muscle, fat: organics
- 1 wild turkey muscle: organics

Dioxins were reported as ND=0. Deer and moose D/F and PCB data were consistent with Canadian studies. Other results were as follows:

- Mercury (0.01 to 1.6 ppm) and DDT (<0.5 to 379 ppb)
- PCBs (<0.1 to 40 ppt teq [1.1ppm])
- Dioxin/furans (0 to 6.0 ppt teq, who 1998)

Bear, deer, ducks, moose, turkey, perch, and panfish showed no contaminants found. Four species of fish were represented; dioxin and PCBs were very low for walleye and perch but tended to jump up with salmon. Six lakes were tested as reference area lakes for background levels. There was some contamination in some lakes; however, there are edible fish available. Consumption guides suggest eating fish three times a week or less depending on your situation – pregnant and nursing mothers, children, should be more cautious. Where the fish were caught and what kind of fish also were of importance.

Leech Lake Reservation
Boy Lake Tulibee (n=3)
DDT = 12 ppb
D/F = 0 ppt TEQ
PCBs = 0.12 ppt TEQ

Six Mile Lake Tulibee (n=3)
DDT = 4 ppb
D/F = 0.02 ppt TEQ
PCBs = 0.02 ppt TEQ

Highest DDT = 84ppb, Tulibee

At subsistence levels there is a significant amount of DDT, which indicates a problem in several lakes. Why it is in some lakes and not others is unknown. DDT was used everywhere.

White Earth Reservation Lakes sampled were White Earth, Many Point, Big Elbow, Bass, McKenzie, Snider, South Twin, and Strawberry. Walleye up to 7 pounds; Northern up to 16 pounds.

Fish Muscle (n=53).

Lake Superior Lake Trout

PCBs = 784 ppb

DDT = 567 ppb

PCBs LOC 4 ppb

DDT LOC 25 ppb

Lake Michigan Lake Trout

PCBs = 1614 ppb

DDT = 1056 ppb

Little River Band 2005 Chinook Salmon (n = 3)

DDT = 83, 113, 154 ppb

D/F TEQ = 0.2, 0.7, 1.8 ppt

PCBs TEQ = 12, 20, 39 ppt

PCBs Total = 334, 488, 769 ppb

We don't know as much about these fish as we would like to know but suffice it to say that they are getting exposed to contaminants in their run across Lake Michigan; they may also get over into Lake Huron where there are a lot of contaminants. In a substantially deep spot the Manistee River empties into Lake Michigan. PCBs obviously are the contaminant of concern here and are quite high; generally speaking, levels of around 1 TEQ are of concern based on old cancer slope factors. The new cancer slope factor is even more dramatic. The numbers on the PCB concentration in these relatively small fish (the largest was maybe 9 pounds), is of real concern. At very low parts per million levels for the Great Lakes TEQ ranged up to 40. More research needs to be done. If this contaminant was uranium the fish would be glowing in the dark! At these contaminant levels it is likely that fish fecundity will be affected as well.

- In response to these results, the following consumption guidance (along with information about commercial foods as well) was provided:
WCBAC (Inland Waters)
- Perch, Panfish, Whitefish, Tulibee, Sucker, Bullhead-unlimited (hotspots identified)
- Deer and moose muscle-unlimited
- Walnuts, hazelnuts-unlimited
- No snapping turtle
- No walleye over 20 inches (smaller 1/mo)
- No Northern over 30 inches (smaller 1/mo)
- Fish eggs and liver-ceremonial use only
- Limit beef and cheese servings to one meal per week (exceptions: cottage and American cheeses unlimited)
- Avoid Tuna.

Conclusions

The MCT is well embarked on putting together a tribal food guidance book and these are some recommendations included in it. This is what we advise and people take what they want, they use these foods ceremonially and for sustenance. The data support previous studies demonstrating the need to know the overall quality of major Tribal traditional and commercial foods. Many traditional and commercial foods may be consumed without limitations due to contaminants. Mercury is ubiquitous but hot spots do exist and hot spots exist for DDT, PCBs, Dioxins/Furans, and perhaps others. Finally, knowing the contaminants present in traditional Tribal foods will allow Tribal governments to inform Tribal members regarding safe food consumption decisions. This knowledge should encourage Tribes to advocate for remediation where necessary and for Tribally protective environmental quality management.

Questions and Answers

Q -- What did you use for consumption rates when coming up with your food guidance?

A -- For mercury we went to a default of ½-lb of fish per day, but for PCB or DDT we took our rates straight out of EPA information: ½ lb of fish a day is the standard, codified by a number of tribal government I work for.

Q -- Has your information been presented to the Tribal community and how have they responded?

A -- That is our next step. We are poised to go to the Tribes -- there are 6 involved at the grassroots levels. We'll be bringing those communities into focus groups and do a pre-test, screen the groups carefully presenting the food guide and letting them work with that for a few months and then come back three or four months later to get their feedback to put into a final food guide. So, that's our strategy. But in general, it's been talked about and we have verbal guidance out in some of the areas, like Cass Lake (our Superfund site), so the Tribal community has the information not to eat the whitefish.

Q -- Do you have any trend line data, in terms of over the years, how are these contaminants going, some seem to be going down?

A -- I've seen the trend line going down in the Great Lakes but this is my first foray into the Great Lakes except for mercury, and though we see a trend line going down for PCBs, for instance, we're still seeing some very toxic fish. I wonder, as we dechlorinate are we increasing contaminants? I don't know, I couldn't find any answers. I'm disappointed that EPA is not doing TEQ in those fish.

Q -- One thing that stood out to me that you only recommend one meal of beef. I wondered why are beef and cheese are on there?

A -- It's just based on a large list. We've got some commercial foods on there too.

A Tribal Monitoring Program To Assess the Human Tissue Accumulation and Health Effects of Persistent Organic Compounds and Heavy Metals Consumed in the Traditional Diet in Rural Alaska Native Mothers and Infants

Martina Lauterbach, R.N., Alaska Native Tribal Health Consortium, Division of Community Health Services, Anchorage, AK

The Alaska Native population is 125,000, representing 19 percent of Alaska's total population -- the highest Native American population percentage of any State. Approximately 65 percent live in rural areas, 35 percent live in urban areas, and 58 percent live in villages of 200 or less. Most of the rural communities have no road connection with major population centers.

About 60 percent of the Alaska Natives live in very remote areas and they are the most subsistence-dependent in the U.S. population. Culturally the traditional diet is critical; Alaska Natives hunt, harvest, prepare, and share their traditional foods. The Alaska Native diet has a beneficial impact due to the large amounts of micronutrients.

Accumulation of organic contaminants in the food web biomagnifies; the developing fetus and pregnant women are most sensitive. Transport of contaminants by ocean, river, and atmospheric mechanisms may be increased by a warming climate. Circumpolar contaminant issues are also unique; global air currents are hemispheric, ocean currents are global, and all local sources are eventually distributed globally. This means that pollutants from all over the world are transported into the circumpolar environment. These include two major categories:

Persistent Organic Pollutants

- Highly persistent, fat soluble, easily transportable
- Industrial origin – PCBs, PBFRs
- Agricultural pesticides – DDT, Toxaphene, Mirex, HCCH
- Industrial by-products – Dioxins, Furans, HCB

Heavy Metals

- Hg, Pb, As, Cd
- All are naturally occurring, and easily transported
- Hg, As, Cd exist in forms that vary greatly in toxic potential

Exposure routes include food chain exposure at low but chronic levels. Most sources are distant, with some local. Atmospheric transport, ocean/river transport, and wildlife transport all contribute to the problem. The effects of exposure routes are notable for their impact on maternal/ fetal exposures. Maternal exposure is mainly through diet, which is often composed of many traditional foods. Fatty acids are very important healthy nutrients and the best source is from fish.

Higher levels of these nutrients in Alaska Natives are probably due to a higher consumption of fish. This illustrates the benefits of traditional diet high in fish. Traditional diet is also thought to help protect against the risk of maternal diabetes. Traditional food has public health and cultural benefits but it is also contaminated through several sources and activities:

- Mining/oil extraction
- Industry, powerplants
- Military Sites
- Landfills, and
- Naturally occurring minerals.

Maternal exposures to persistent organic pollutants (POPs) and heavy metals are decreasing in “lower 48” United States women but no trend data are available for Alaska Native Women. The fetal exposure route is transplacental while newborns are exposed through breast milk. There are several types of potential adverse effects in newborns from exposure to POPs, Lead, Mercury, Cadmium:

- Growth
- Neurological (cognitive impairment), and
- Immunological (infections).

Alaska Natives in the rural communities have a rising concern about contaminants and possible risks of threatening their culture and their health. The Tribal Council from two regions requested evaluation and monitoring of the POCs, and the tribal council signed a resolution, which authorized ANTHC to create the monitoring program.

The maternal blood levels of contaminants found in Alaska Native women are similar to those of Scandinavian women, and in the United States to all races combined and women of child bearing age. Maternal and infant pairs were recruited during the first prenatal visit. Mothers received information about the program, signed consent forms to be in the program, and a completed dietary history.

Specimens from mother and infant were obtained at this time, and medical records were reviewed. A prospective cohort of maternal-infant pairs were drawn from the Yukon-Kuskokwim Delta, the Arctic Slope, and the Aleutian/ Pribilof Islands. This multi-year program was started in 1999. The first cohort finished enrollment in 2003: 205 mothers, 91 newborns.

A wide variety of analytes were monitored:

- Metals -- lead, cadmium, mercury, arsenic
- POPs -- Persistent pesticides, e.g., DDT
- PCBs
- Selenium
- Micronutrients Lipid content & omega-3 fatty acids, and
- Toxaphene, brominated flame retardants, and perfluorinated octane sulfonates (PFOS).

Laboratory Analysis was done for POPs and metals by the National Center for Environmental Health, CDC; Johns Hopkins University did micronutrients; University of Alaska at Anchorage did Omega-3 fatty acids.

Results showed that of the essential POPs, only beta hexachlorocyclohexane, oxychlor, t-NONA, and DDE were above the limit of detection. Of these, only DDE was statistically different from the NHANES population (lower than NHANES). For the infants, all POPs were below the limit of detection except DDE, which was lower than the adult population. For mothers, geometric mean concentrations for cadmium and mercury were significantly greater than those reported in the *Second National Report on Human Exposure to Environmental Chemicals*. Lead was not different than for the NHANES population. Urinary mercury concentrations were higher than NHANES. Geometric means for urinary arsenic were 18.9 ug/L but there is no population level for comparison. However, the 95 percent CI was 15 to 23, which is less than the level of 50 that has been associated with possible adverse health outcomes.

Correlations were found between health outcome (pregnancy outcome and rate of infectious disease during 1st year of life) and blood levels. There was a correlation of levels of PFOS, PBFR, and Toxaphene between mothers and infants, and a correlation of levels of POPs and micronutrients with dietary history.

Questions and Answers

Q -- Why did you say Alaska native women have more PDBEs?

A -- Probably because we use a lot of flame retardants in clothing.

Q -- I'm from Scent, Alaska and we haven't had any luck getting funding to do similar sampling in our area; do you know if IHS has plans to do anything on that? And I was wondering why the level for mercury in Alaska Native men was so much higher?

A -- I'm not sure about the mercury issue in men, I'd have to talk to my boss about that. As for doing the south central area study, we'd have to get some resolutions from the villages before we can do any of the programs or studies.

3 P.M., TRAINING: OVERVIEW OF QUALITY ASSURANCE TOOLS – TURBO QAPP

Facilitator:

Elizabeth Jackson

(See the description above of the 1 p.m. session)

Turbo QAPP

Melinda Ronca-Battista, Institute for Tribal Environmental Professionals, Tribal Air Monitoring Support Center, Phoenix, AZ

3 P.M., TRAINING: OVERVIEW OF WATER QUALITY STANDARDS FROM A TRIBAL PERSPECTIVE

Monitoring

Nancy Schuldt, Fond du Lac Reservation, Environmental Program, Cloquet, MN

Tracey Ledder, Bad River Band of Lake Superior Chippewa, Odanah, WI

Gretchen Watkins, Lac du Flambeau Band of Chippewa, Lac du Flambeau, WI

Nancy opened this final session with a brief, edited version of the water quality monitoring module used at the tribal water quality standards academy. This introduction touched on key aspects of developing a tribal monitoring program: identifying the monitoring objectives, designing a monitoring approach to achieve those objectives, data collection (field and lab), data management and interpretation, and conveying the information gained in a monitoring program to the public and the EPA. Water quality monitoring supports a water quality standards program, by tying the monitoring framework back to the designated uses and criteria. Monitoring data can be used to develop and revise WQS, assess attainment of designated uses at various spatial scales, identify both impaired waters and those in good condition, and ultimately protect and restore waters.

Tracey Ledder then presented a case study relating Bad River's approach to water quality monitoring, linked to their designated uses. Bad River is monitoring, among other parameters, nutrients, solids, fecal coliform, alkalinity and hardness, and stream flow; using Hydrolab and YSI multiprobes as well. There was no existing water quality data for Bad River waters, prior to 1997.

Their monitoring data has identified elevated nutrient concentrations in some areas, but they are still attempting to better define ambient or background nutrient levels for waters in this ecoregion. Also, the Marengo River exceeds the state and federal fecal coliform criteria, especially during and after rain events, as it reaches the reservation boundary. In this watershed, there are historical issues with failing septic systems, and some small dairy operations. Bad River elected to add some "chased" rain event sampling to their monitoring program to better understand the relationship between high flows and bacterial exceedences.

Jurisdictional issues have limited the ability to take action thus far; only the tribe has this critical bacteriological data, but the Town of Marengo does not accept this data as justification for reviving a proposed sewage district. Wisconsin DNR and county staff shortages add to the problem of finding a 'fix' for this impairment, but cooperation with a regional watershed agency (bacterial sampling from headwaters to the edge of the reservation) may lend credence to their efforts to control bacteria levels. Gretchen Watkins spoke about Lac du Flambeau's watershed assessments and their water quality monitoring strategy. Basically, they have been doing a comprehensive assessment of lakes (baseline

assessment of all lakes over 40 acres), streams (baseline assessment), and wetland (vegetation inventory and water quality); and have included targeted assessments (investigating sources of pollution). With this approach Lac du Flambeau is able to assess over 90% of their lake water acres, but many small lakes (56%) are not assessed. The targeted assessments have been used thus far to monitor impacts from commercial cranberry operations, stormwater runoff, shoreland development, and mercury.

Assessment: Attainment or Impairment

Nancy Schuldt, Fond du Lac Reservation, Environmental Program, Cloquet, MN

Jeff Ogburn, Taos Pueblo Environmental Office, Taos, NM

Nancy used a portion of the “Introduction to Assessment and Attainment” module from the tribal water quality standards academy as an intro to this final WQS overview topic. She briefly touched on §305(b) reporting, §303(d) listing and TMDLs, before presenting a short description of Fond du Lac’s experience in waterbody assessment and 305(b) reporting. She explained the way that Fond du Lac utilized its monitoring data and numerical criteria to determine whether or not each waterbody was *fully supporting*, *partially supporting*, or *not supporting* its designated uses. She emphasized the usefulness and legitimacy of including best professional judgement by tribal natural resource and environmental staff in reaching these assessment decisions. Fond du Lac also has opted, in its 305(b) reports, to assess mercury impairments (human health uses) independently from aquatic life uses. Most lakes and streams on the reservations are fully supporting their designated aquatic life uses, but all of the waterbodies that have been sampled for fish mercury concentrations do not support unlimited fish consumption, due to widespread mercury contamination of the fish commonly consumed.

Jeff Ogburn gave a case study of Taos Pueblo’s experience in collecting water quality data in support of their water quality standards program. The Taos Pueblo Environmental Department’s knowledge of their water resources (their cultural values and usage as well as their ecological values) has enabled them to put their monitoring data into context. In their assessment process, the Tribe first determined the goals for the watershed and incorporated Tribal knowledge, such as river use sites and plants collected, into the monitoring design. Traditional knowledge was used to establish designated uses, such as for drinking and spiritual use. Next the Tribe gathered information on watershed stressors and response indicators, like algal blooms and changes in plants.

In upgrading data to information and knowledge, current conditions were compared to expected conditions. Healthy waters and impaired waters were identified, and a protection/restoration plan was developed to tell the story of the waters. The assessment is revisited regularly to determine if data quality objectives (DQOs) are being met and whether information is being turned into knowledge about how to manage the watershed. Thus, a baseline was built to determine the attainment of WQS, using biological, toxicological, physical and chemical indicators. Reference conditions were the benchmarks set to compare current conditions found in the watershed.

Jeff also queried the audience as to their ideas and experiences in taking water quality monitoring data and turning that information into an analysis and report on water quality conditions. Often it is difficult to take this last step in the process of a water quality protection program, and provide information back to the community and EPA offices.

**Evening Event
Film Screening**

Homeland: Four Portraits of Native Action

Directed by Roberta Grossman

Produced by The Katahdin Foundation

This feature-length documentary film tells the story of Native American activists fighting to preserve their land, sovereignty, and culture. Framed by the words of Winona LaDuke, HOMELAND presents a vision of how people all over the world can work towards healthier lives and a greater respect and care for the planet we share.

Alaska Native Diet: Monitoring For Contaminants In Rural Alaska

Produced by Aleutian Pribilof Islands Association, Inc. and World Turtle Productions.

The film "Monitoring for Contaminants in Rural Alaska" covered several topic areas including: sources of contaminants, pathways of contaminants to the Arctic and rural communities, and the role of the Alaska Native Traditional Food Safety Monitoring Program as a tool that Alaska and Kamchatka Natives can use to better monitor and understand diet and the levels of contaminant exposure. While identifying the range of communities participating in Alaska, the film focuses on the community of St. Paul and explores how the program is helping this rural community to address concerns about exposure to contaminants and its implications for public health.

Thursday, September 28, 2006

8 A.M., AIR DEPOSITION

Facilitators:

Christine Berini and David LaRoche

Fond du Lac Reservation Comprehensive Mercury Monitoring Program

Nick Axtell, Fond du Lac Reservation, Environmental Department, Cloquet, MN

Nick Axtell has been employed by the Fond du Lac Band of Lake Superior Chippewa since March 2003 as the Air Program Coordinator. He got his Bachelors of Science in Chemical Engineering from the University of Minnesota Duluth. During his tenure as a student, he researched the biosorption ability of aquatic plants to remove aqueous metallic ions from water, and had an internship with the American Indian Environmental Office in Washington, DC. In addition to his duties at Fond du Lac, he serves on the Executive Committee as a representative for Region V in the National Tribal Air Association.

Fond du Lac partnered with the Minnesota Department of Health to collect and analyze fish tissue contaminants from reservation waters, and develop culturally sensitive fish consumption guidelines for the tribal community, many of whom rely on fish at a subsistence level. Mr. Axtell described the process as summarized below:

Fond du Lac Reservation is located in northeastern Minnesota in a rural area about 20 miles from Duluth/Superior. The Reservation layout is comprised of 101,000 acres including 45,000 acres of wetlands and 2,855 acres of lakes. There are 3,800 Band members. Ceded Territories cover 8 million acres.

Atmospheric deposition of mercury is of particular concern in the boreal forest and wetland ecoregion of Northeastern Minnesota, as geochemical and microbial processes enhance mercury availability to the aquatic food web. In its methylated form, mercury bioaccumulates in the higher aquatic trophic levels to concentrations that are hazardous to top predators (piscivorous fish, eagles, osprey, loons, kingfishers, mink, and otters) and humans. Consequently, fish caught in reservation waters can be dangerously high in mercury content.

The Tribal Air Program has been monitoring atmospheric deposition of mercury weekly since 1997, and has specifically measured methyl mercury deposition since 2001. To better understand the fate and transport of mercury in aquatic ecosystems, the Tribal Office of Water Protection has initiated several projects to investigate mercury levels and potential exposure scenarios. Two sediment assessment projects measured mercury and methylmercury in reservation lake and stream sediments, and results indicated that sediment mercury levels exceeded threshold effects concentrations in all water bodies.

The Fond du Lac Air Program was established in 1999. We have one full-time and two part-time employees and have monitored for six pollutants. A wet deposition monitor is used -- not to be confused with a dry deposition monitor -- to measure rain and snow. Generally this type of monitor catches 85 to 90 percent but it doesn't catch as much in winter. Measurements are collected weekly. We stopped monitoring for certain contaminants because we lost some EPA funding. We make collections in small bottles but if we get a big rain it will overflow so we keep a bucket there too and measure the overflow and make notes on that as well. When looking at weekly accumulations, we tend to get a lot of spikes around June, July and October, probably because it rains more in those months.

Concerns with mercury are of particular interest in boreal forest/ wetland ecoregions because they are very sensitive to mercury deposition. Methylation occurs due to watershed characteristics. And mercury then bioaccumulates up the food chain.

Some facts about mercury in Minnesota from Year 2005 Data:

- 3,341 lbs released in MN (down from 3600 lb in 2000).
- 98 percent was discharged to the atmosphere.
- Only 10-30 percent of deposition comes from in-state sources.
- 58 percent of mercury emitted comes from energy production (up from 51%).
- 22 percent is from "purposeful uses" (down from 28%).
- 20 percent is from materials processing (down from 21%).

Updates at the site include replacing an old M.I.C. monitor with a NTN monitor in 2002 although we are not using NTN analysis. We implemented methyl mercury analysis in September 2000 and ended in March 2005. Currently, we are integrating our mercury deposition, water quality and watershed data with our sediment mercury data to evaluate potential correlations and to better understand the implications for protecting human health and critical aquatic resources.

Next Steps

- More taconite plants coming online means we will need to look for and monitor localized hotspots.
- We need to secure additional funding to what the Tribe is paying for monitoring.
- We need to restart methyl mercury monitoring.

Questions and Answers

Q -- Is the 20 percent you mentioned from emissions?

A -- Yes.

Q -- Can you explain what taconite is?

A -- Taconite is a product of iron ore processing; when they process they ship it out in these little balls. Mercury is emitted when they fire up the ore.

Q -- I was curious about where your monitors are; are there people there?

A -- No it's a clearing in a forest. There are a few offices there and during the summer there are people there for a forestry camp for a couple of weeks. It's probably fifteen thousand acres

Q -- I was just wondering if there was any effect from being downwind from an urban area in terms of where you place the monitors.

A -- We have a very urban looking cycle for ozone -- generally in rural areas you see a flatter graph, but we have a lot of peaks and valleys, the same as you'd find in an urban area.

Comment --What would the tropospheric height of mercury concentrates be? Could that be having an effect and is any technique that would capture that?

A -- I don't know how you'd measure that.

Q -- Do you have any information on public awareness, at the Tribal level and others?

A -- The state of Minnesota released the Hg TMDL study trying to integrate information from the air and water program, but the way they did that study was very controversial because they met behind closed doors with industry. When that was discovered there was quite an outcry. When they released the final study some key statements had been removed at the request of industry. But it came back to bite them because the study shows that most of the emissions were from outside the state and they couldn't use it to get any changes in the state. They went back and eventually the three largest emitters in the state have had to make changes. Overall in the state there is a lot of public awareness.

Mercury Fate & Transport on the Fond du Lac Reservation

Nancy Schuldt, Fond du Lac Reservation, Environmental Program, Cloquet, MN

Nancy Schuldt is the Water Projects Coordinator for the Fond du Lac Band of Lake Superior Chippewa, and has been working for the Band since September 1997. She has a B.S. degree in Biology from the University of Dayton, and a Master's degree in Aquatic Ecology from the University of Kansas. She has been involved in developing Fond du Lac's water quality standards program, which includes a comprehensive water quality monitoring program, assessment and reporting, data management and analysis, and criteria development. She also is responsible for the Band's Nonpoint Source Management Program, and numerous water resource investigations related to protecting and restoring Reservation waters. Her presentation built on what Mr. Axtell had already discussed. She added the following remarks:

The Tribal community relies upon natural resources for subsistence: wild rice, fish, waterfowl, and game and given what we know about bioaccumulation, the community has health concerns about exposure to environmental contaminants. Resource monitoring and protection efforts acknowledge mercury risks. In addition to the human effect, wildlife is a big concern as well, especially birds, but also fur-bearing wildlife. We wanted to do this assessment to find out what was going on with mercury falling into our watershed -- which is huge, by the way. Our reservation is almost all water. At the same time we looked

at PCBs and lead. There had been a direct connection found for uptake of heavy metals in wild rice. We wanted to get a sense of the overall effect on the watershed as well.

GLNPO funded a study of 12 reservation lakes to characterize sediments, assess contaminant levels in the bioavailable portion (Hg, PCBs, Pb), and do toxicity tests. A sediment quality database was developed; an additional indicator of reservation water quality was also done. Results showed, as expected, higher mercury values associated with organic sediments. 30 of 96 sites had dry weight mercury exceeding the Level I SQT of 0.18ug/g. Shallow wild rice lakes, and shallow flowage lakes (highly stained) had consistently higher mercury levels.

We saw a definite relationship between water depth and mercury concentration so we wanted to be sure to take samples at different depths. Also, looking at Perch Lake, which is primarily wetland with wild rice in the south basin and fisheries in the north basin, we saw very different characteristics. We sampled at various places as rice was harvested and after processing. We also sampled wildfowl and moose, because these are all traditional foods for the community.

Phase II of the Sediment Study GLNPO project included twelve St. Louis River sites, looking at the same parameters as before, plus methyl mercury. We analyzed archived samples from the first study for MeHg and added to the database. We also partnered with the Minnesota Department of Health to study fish contaminants and develop a culturally sensitive consumption guide. Fish were collected from reservation waters; we targeted species that are commonly eaten by Tribal community members. Mercury drives consumption restrictions (we ruled out PCBs, organochlorine pesticides, toxaphene).

A Wild Foods Study was based on our goal to find a culturally appropriate way to develop guidelines, where and what kind of fish, what size, how much can you safely eat? You can't just say to people, don't eat fish. Because we knew that PCBs weren't an issue in the area we didn't include them in this study. But, because we knew about lead uptake in wild rice we wanted to learn more about that. We did a comprehensive risks/benefits analysis funded by Minnesota Sea Grant and asked do cultural and nutritional benefits of wild foods (vs. market alternatives) offset contaminant exposure? Wild rice, waterfowl, and moose were analyzed for mercury and lead. Waterfowl and fish have comparable mercury levels.

Clearly, to understand mercury impacts on human diet, fish is not the whole story. Fortunately with wild rice we weren't finding high concentrations of lead or mercury. More testing needs to be done, keeping in mind what the state and federal government are doing to reduce emissions, but knowing we have sources of pollutants in our own backyard.

Next Steps

- Continuing studies sampling more waterfowl
- Update fish tissue data
- Ongoing atmospheric deposition monitoring, and
- Partnering on study of mercury methylation/demethylation rates, *in situ*.

Questions and Answers

Comment -- I know that USGS has been looking at mercury methylate in fish and I was wondering if you had worked with them? And also have you looked at interaction between factors, have you done any multifactor graphs, for instance PH and dissolved carbon?

A -- We couldn't show any relationship between PH and mercury contamination. We have a pretty narrow range, and I am aware of the other studies you mentioned.

Comment -- We looked at some populations in Washington and did blood work and found that levels weren't too high except in those who were eating the whole fish, some immigrant populations, for instance Russians who grind up whole carp to make fishcakes.

Alaska Native Science

Larry Merculieff, Seven Generations Consulting, Anchorage, AK

Larry Merculieff has almost four decades of experience serving his people, the Aleuts of the Pribilof Islands and other Alaska Native peoples in a number of capacities. His reach has been broad and varied; a few of the positions he has held include City Manager of St. Paul Island, Commissioner of the Alaska Department of Commerce & Economic Development (a cabinet post), President and CEO of Tanadgusix (A.K.A. TDX) Corporation, and Deputy Director of the Alaska Native Science Commission. A synopsis of Mr. Merculieff's remarks follows.

I don't have a presentation, because an elder told me that anybody who has to get up in front of a group of people and has to work from a piece of paper shouldn't be up there. I find that when I made that shift I started speaking more from the heart.

I had a traditional upbringing, I think the last generation who really had that. I was raised by the whole community. The women took me out berry picking; I watched them cut up meat. I spent time with the elders. I spent time with the hunters and the fishermen. And of course with my peers. The name I was given when I was four is "cuhya" which means extension. By age five I had an "acha." It's a relationship between a younger person and an older person, and it was so strong. He taught me much of what I know about being an Aleut man, about what I know about ethics and values, hunting and fishing, being a keen observer. From age 5 to age 13, when he took me under his wing, he may have only said 200 words to me because words were superfluous.

He would take me out to hunt sea lions. Sea lions to us were like buffalo to the plains Indians. I would sit out there for hours and hours and I was given the opportunity to explore out for as far as I could for myself. He didn't place boundaries on my way of knowing. I would notice that hunters seemed to know that the sea lions were coming before they came. And four or five guys would shoulder together, within microseconds of each other. It was an amazing process to watch. By age eleven I could read the winds, tides and currents; I could navigate in fog without instruments; I could feel the subtle movements of the water, the energy of the water, and smell and see the difference in the water. I could watch the birds that came through the water and all this gave me cues.

At age eleven I shot a sea lion. I knew the instant of its death; I felt the sudden energy that said, I have consciousness and I have energy and I am giving myself to you. Nobody had ever told me about this and afterwards I went to my acha and told him and he looked at me, nodded his head and said "good."

So that's the kind of upbringing I had. Throughout the entire village I would be welcomed in any home at any time. I was always affirmed. I was never scolded. To grow up that way is very special. And never being given instruction is very special. The understanding of the way of knowing comes from the notion of the real human being, the fact that we have a profound connection to creation -- that is the spirituality basis that western science is very uncomfortable with. It creates particular kinds of challenges.

On the western side of my experience, I have immersed myself in Cartesian-based science, in the Bering Sea where I lived I have talked to every scientist I could, read every white paper. I was one of four Native Americans on the White House Council on the Oceans. And so on. The point is that I do understand western science.

Back in the 1970's our people started noticing things that were anomalous. So we knew something was happening out there in the Bering Sea that was pretty profound and the problems indicated food stress to us and seemed to be system wide. So we started flagging this in different kinds of western forms, but nobody listened. And then finally, thirteen years later in 1990, the scientists put together a food conference and concluded that we were experiencing this food stress. Sea lions were declining, 80 percent loss of sea lions, some species of bird down by 80 percent, harbor seals, sea otters, red face cormorants –it's an ecosystem-wide phenomenon. This is going to affect all native cultures all across the north and eventually is going to affect down here. But nobody would listen to us. After ten years of effort a theory was developed that high sea drift net entanglement was the cause of sea lion decline. It contributes, but it is NOT the cause. If they had listened to us they would have saved time and money chasing after wrong hypotheses.

Any people who have a sustained connection to their environment for thousands of years notice things. We see it in terms of connection. Bird guano. Very important. Scientists never looked at the loss of bird guano, an effect of the loss of two million sea birds. Just last year scientists studying in the Aleutians discovered that the PHs and nitrates transported inland were necessary for grasslands to exist. The elders talked about how a single drop of gasoline would harm the ecosystem. Then we have the Valdez. Scientists then study outboard motor gas in the rivers discharging 2 gallons of gas.

The average Alaskan Native consumes 420 lbs of wildfoods per capita – our relationship to the environment is still close, so we notice things. People started noticing changes -- ice thinning, beavers moving in to Alaska; we found belugas in the center of Alaska; salmon meat hanging to dry just fell off the skin, lesions on fish in all the rivers. Elders noted that water levels are going down in all the rivers, the temperature is going up and the fish are scraping against the rocks on the bottom. Water temperature is going way up; parasites began appearing years ago, but just recently began being studied. All these things are the result of warming.

Native people with a sustained connection to environment will and do know a lot of what is going on. I want to change the way people talk about Native knowledge. Knowledge without wisdom is useless. I'm not trying to put down western science, but they do not have the kind of picture that Native people have about what is going on. Western science is quantitative. The traditional way of knowing is qualitative. It's not to say one is better than the other, but without the component of the Native way of knowing, western science is weaker than it needs to be. They truly have not come together, because of institutional competition, mandates of agencies, jealousies. I regret that Native people throughout the world are meeting the mandates of the institutions that have funding. We need the money. But what really is needed is forums where we have Native people discussing among ourselves what is happening. After that, then we can sit down at a conference like this and negotiate. We don't want to just meet the goals of federal agencies. If we do that we lose our young people, we lose our native ways of knowing.

I think about the benefits of Native ways of knowing:

One, we can flag anomalies sooner than anybody else;

Two, we can help hone in the hypotheses to save time and money;

Three, we can provide history, our elders can remember, our stories go back further;

Four, we can compare today's observations to the models of scientists.

I think that things are changing so fast today that the number of variables in the ecosystem can't be evaluated quickly enough by western science. In ten years the whole ecosystem has changed. Working with local people gives you a chance to create real partnerships, real partners can advocate for funds from agencies.

Our elders told us that seals and birds are like honey bees—they send out scouts for food. We brought this idea to western scientists and they said they needed proof. But they couldn't tell us what they needed to get the proof. We worked with Russian scientists and they told us exactly what we could do. We took this information to the Forest Service and showed them, asked them what we need to do next. They said radio telemetry. How much would it cost? \$400K, and we got it. From that point on the scientists and the Alaskan Natives really came together, so it can work. One last point look at this website www.nativeknowledge.org, and also www.nativescience.org

Next Steps

What do we need to do? First educating of the decision makers within the government arena. We need to have capacity building in communities so that they can determine what their concerns are, and I see improvement on this through EPA. We need a forum just amongst Native people and then we need a Native conference and commitment for funds for demonstration projects.

Questions and Answers

Q --You mentioned you're on the Native American Fish and Wildlife Commission. They've been doing a lot of good training for us but I hear they've lost funding. Are we going to see any more money for this in Alaska?

A -- No, most of the money is going to the Iraq war and other places.

Q -- You said you were the last generation to get the traditional knowledge. What is your community doing about this for young people now?

A -- Well, it's sad but we have to create more artificial means for teaching kids now; we've got spiritual camps where we bring together young people and the elders. One of the things kids up there did, several vessels went aground up there, seven of them, and we were talking about what we could do about it. In one case, the owners abandoned a vessel and nobody would claim it or deal with it. So we sued all of them and got a seven million dollar settlement to take it apart. Kids went through a public education program, got village support, and they took the vessel apart to recycle.

Comment – You might be interested to know that there is world indigenous conference in the makings now, not including scientists.

8 A.M., WATER AND COMMUNITY HEALTH

Facilitators:

Curtis Munoz and Dana Davoli

Emerging Issues: Contaminants in Our Environment, Endocrine Disruptors, Pharmaceuticals and Personal Care Products

Dr. Kim Winton, Director, USGS, Oklahoma Water Science Center, Oklahoma City, OK

Dr. Winton, now with the USGS Oklahoma Water Science Center, has worked in the agriculture industry with chemical breakdown products from pesticides and fertilizers. She has found it particularly difficult

to standardize the methods used by chemical handlers to measure biological effects. Even though the same instructions are given to all users of chemicals, samples come back with different results in chemical breakdowns. Other USGS centers have had the same problem. There is a need for consistent protocols, study design, and quality assurance.

Emerging contaminants (ECs) are organic compounds newly discovered at measurable concentrations in the environment, such as hormones, food additives, detergents, disinfectants, and pharmaceuticals. Methods for their analysis are still experimental, and analytical methods are still being developed. ECs are sporadically detected in the environment in parts per trillion concentrations. Human health and environmental effects from long-term exposure to such small concentrations are uncertain and may be negligible.

Some ECs are steroids and sterols, naturally occurring and synthetic lipids, or fat-soluble chemicals, including alcohol (sterols), bile acids, many hormones, some natural drugs, and poisons found in the skin of some toads. Cholesterol is a sterol. Steroid hormones include the adrenal cortical steroids hydrocortisone, cortisone, aldosterone, and progesterone, and the male and female sex hormones, testosterone and estrogen. Most oral contraceptives are synthetic steroids. Cortisone and its derivatives are the most widely used steroids in medicine.

Many studies in the past 10 years have indicated that ECs, including some pesticides, plasticizers, nonylphenols, synthetic musks, hormones, and polyaromatic hydrocarbons (PAHs) are estrogenic and can be taken up by aquatic biota. This can cause a decrease in fertility, the presence of both male and female hormones and reproductive organs in fish, amphibians, and rodents as well as physical malformations (e.g., frogs with six legs). Estrogenic compounds bio-accumulate and mixtures have additive effects.

Zeranol, a growth promoter for beef, and estradiol-17 β have been linked to increased risk of breast cancer and autoimmune diseases in humans. Phthalates in pliable plastics have been linked to greater occurrence of female characteristics in baby boys. Sources of ECs include wastewater treatment plants, domestic septic systems, industrial discharges and livestock confined or concentrated feeding operations (CAFOs). Animal feed often contains hormones. Surface runoff from sludge application of poultry litter can contain ECs. Caffeine and food preservatives can also be ECs.

A major problem is determining where the ECs are coming from. In 1999 the USGS did a national stream study. For 139 streams sampled in 30 states, 62 basins had CAFOs present, 52 were in urban basins, 17 were in mixed land use basins and eight were in minimally developed basins. Five analytical methods were used to look for compounds in streams. Even cities with wastewater treatment plants don't have the analytical capacity to recognize EC pollutants or implement ways to treat them.

A total of 95 wastewater organic compounds (ECs) were analyzed from sites across the U.S., including 22 antibiotics, 14 prescription drugs, five nonprescription drugs, 15 hormones and steroids, and 39 household and industrial compounds. ECs were detected in almost 80 percent of samples, and 82 of 95 ECs were detected at low concentrations of less than 1 ppb to 6 ppb. Few health standards or guidelines were exceeded, but only 14 of the 95 ECs had standards. Detection of multiple ECs was common.

A total of 34 percent of samples had more than 10 ECs. The most frequently detected ECs were fecal sterol, nonprescription drugs, DEET (insecticide), detergents, disinfectants, and plasticizers. In looking at six Oklahoma and Arkansas sites, fecal steroids (cholesterol) were detected at four sites; caffeine, soap, and a plasticizer at two sites; and several other ECs at one site. There are poultry farms in northern Arkansas. There were 18 "other" hits for ECs. Several antibiotics were found in a site on the Mississippi River near St. Francisville, LA, which could lead to treatment-resistant bacteria.

Other studies include one in 2002 by USGS of stream bed sediments and water samples at five Oklahoma stream sites. New analytical methods and revisions of previous methods were used to analyze more than 100 compounds. An article summarizing the results will be published in the near future. Another study between March 1999 and March 2000 sampled 10 groundwater wells and surface water sites near the Ozarks to look for bacteria.

At the Cave Springs Branch of Honey Creek in Delaware County, Oklahoma, of 47 ECs being evaluated, the groundwater had fewer compounds than the surface waters. The highest detections were four types of detergents found 9 times, five types of plasticizers found seven times, two types of disinfectant found seven times, three types of fecal sterols found seven times and two types of preservatives found 9 times.

In the Turkey Creek watershed of northwest Oklahoma from 2002-03, very few groundwater detections were found, but PAHs (from fuels), fecal sterols, fire retardants, stimulants and detergents were found. There is a medium-sized city in the headwaters of the study area as well as an agricultural basin. Another Oklahoma study of swine feeding operations in 2001 found 38 detections of fecal sterols and 32 of household detergents. A total of 34 of the 78 groundwater monitoring wells had hits.

In the Cimarron Terrace Aquifer, in 2003, with an agricultural and grassland watershed, groundwater wells showed that the highest level of ECs were detergents and household cleansing products from septic systems. Eight different pesticides were found, mostly Atrazine. Phenol was detected 23 times and DEET was found frequently. A total of 28 groundwater wells out of 45 had contaminants. Of 72 EC compounds screened, 20 ECs were found.

In northwest Arkansas in 2004, sites upstream and downstream from a wastewater treatment facility were sampled for 108 analytes or EC compounds. All but one site had at least one detectable EC. Downstream sites had more ECs than upstream sites. A background site had detections similar to the upstream site. ECs with the highest (five or more) detections included disinfectant (phenol), detergent metabolites (para-cresol), disinfectant tri(2-chloroethyl) phosphate and several flame retardants, fragrance/flavorings, non-prescription drugs (caffeine), insect repellent (DEET), and fecal sterols.

In summary, ECs may be useful indicators of possible sources of accompanying chemicals, such as nitrate or phosphorus. They may or may not be conservative in hydrologic systems. Low concentration health effects are not known, but antibiotic resistance in bacteria is common as are endocrine disrupting effects in fish and amphibians. Pharmaceuticals may be the next recharge/discharge age-dating tool. Background levels in water basins are not known.

Next Steps

We need to look at what we can do immediately:

- Examine our own household chemicals and try to reduce or switch to less harmful ones
- Have a center where unused medicines and other products can be turned in
- Develop new ways of water treatment, i.e., new technology, and
- EPA is doing and should continue doing research on the impacts of ECs on aquatic life and human health.

Questions and Answers

Q – Is tertiary treatment sufficient to extract ECs?

A – It depends on the compound. A large percentage of ECs are extracted using activated charcoal, but there is no one treatment that gets all ECs at present.

Q – Do we need a higher level of water treatment?

A – Perhaps a higher treatment level could be designed, but we need more studies.

Comment – EPA uses this data from the USGS and tries to respond to what is being found. EPA has a standard for Atrazine, which is found everywhere in agricultural basins. With human feces being the source of many ECs, it is difficult to analyze and determine where there are problems. We need to do something about eliminating the contaminants. Bacteria can easily change form as well.

Q – Public health advisories say to flush old pharmaceuticals down the toilet. If we were able to catch the ECs at the treatment plant, what would we do with them?

A – The best defense is a good offense. Don't throw old drugs in the toilet. Once in the groundwater, they are difficult to deal with. Some biodegrade over time.

Q – Of the 95 ECs, there are only 14 with a water quality standard. It takes EPA years to get from the scientific data with these pervasive compounds to establishing standards. How can we deal with that?

A – In EPA's defense, all of these compounds are emerging science. Even with the standard analytical methods, it takes a long time because the compounds react differently in acid or basic pH soils, for example, or in different waters.

Comment – Some phthalates/flame retardants are around a long time, but other countries are dealing with them. We need cautionary information. The U.S. is behind. However, if we get a handle on one problem, then another new compound springs up. We have a very active chemical industry.

Assessing Overall Concerns From Hazardous Waste Sites on Tribal Lands

Dr. Lynn Zender, Zender Environmental Science and Planning Services, Anchorage AK

Dr. Zender lives in Alaska and has worked with Native American Tribes on environmental issues for eleven years. She has worked on a nation-wide, EPA-funded program to find issues and concerns at hazardous waste sites on Tribal lands and to develop ways to work with the Tribes on solutions. A model for intangible risk assessment is needed for contaminant studies. Quantitative contaminant exposure does not accurately describe Tribal risk. For example, one contamination problem has developed in the hauling of "honey buckets" (human waste disposal bins) from homes to the disposal site.

There is no indoor plumbing in some small villages. There may be skin exposure and contamination from the material to the waste haulers' skin. There may also be inhalation issues where open burning produces smoke. In addition, study was needed to determine whether there are children playing at the hazardous waste site and coming into contact with hazardous material. The frequency of contact needed to be assessed.

The purpose of this one-year project in 2004 was to assess the overall national situation of hazardous waste sites on, or next to, Tribal lands and to describe the risks to Tribes that the sites pose. Sites were identified through federal databases, agency web sites, and by 115 responding Tribes nationwide. This information has been compiled into a new database, called Tribal Hazardous Sites Registry (THSR) that Tribes are reviewing. Responding Tribes answered questions about risks to their lifestyles. A separate

empirical study was performed that provides added context and a relative health symptom risk study. A model was developed to determine physical risks from contaminant exposure.

Over 15,000 hazardous waste sites and facilities that present potential risks to Tribal lifestyles were identified. About 979 were Superfund sites, 582 were hazardous waste facilities, 1,104 were open dumps, 7,884 were mines, 4,075 were leaky underground storage tanks, 320 were formerly used defense sites, at least 33 were Brownfields and 88 were newly identified sites or site groups.

Tribes were then asked to rate the sites as a concern. Surveys were sent to 559 respondents. Telephone calls were made to verify receipt of the survey. There was an overall 20.6 percent return rate. This response rate yielded enough data to have statistically significant data. However, conclusions weren't drawn for Tribes not covered in the survey.

Do sites affect Tribal lifestyles? The answer is yes. Fifty-seven percent of Tribes responding have changed their subsistence activities due to concerns about hazardous sites. Nearly 80 percent of all the sites have affected subsistence practices in some way. Seventy-four percent of the sites have affected other traditional practices in some way. In addition, 52 percent of responding Tribes said that life ways such as performing ceremonies, making baskets, art, tools, and making traditional medicine have changed because of concerns about a hazardous waste site.

Findings showed that 91 percent of Tribes have some members practicing traditional activities. In Alaska the top three activities are: 94 percent hunting and fishing; 66 percent gathering and everyday use of plants; and 68 percent use of smoke houses. In the lower 48 states, 68 percent of Tribes hunt and fish, 63 percent conduct powwow activities, 56 percent conduct ceremonies with smoke, gather and use plants, and farm.

About 58 percent of hazardous sites affect subsistence practices substantially, with concerns from 80 percent of respondents about sites changing where Tribes hunt and fish. However, traditional practices continue at sites that are significantly contaminated. Seventy-one percent of Tribes said traditional activities take place on or next to a site of concern; 58 percent consume fish, game, or plants from a contaminated site; and 33 percent have some Tribal members who drink untreated water from streams with site drainage.

A related study showed that Tribal members were generally unlikely to trade off their traditions in exchange for physical benefits such as clean food and environment or long-term physical health. Short-term health effects from being at or next to a hazardous site in the past 10 days included dizziness, stomach upset, diarrhea, sore throat, cough and headache. Other findings include the following:

- 43% of Tribes changed where they hunt, fish and gather foods; 27% changed the activity frequency
- 34% changed how much food they consumed; 39% changed how much traditional food was eaten
- 39% changed what type of traditional food they ate; 30% have stopped a subsistence activity
- 40% changed where traditional lifestyle activities take place.

Another questionnaire was developed to determine how much tradition matters to Tribes. This study was not done with EPA funds. Tribes were asked if changing a tradition matters as long as the tradition is still performed. A total of 76 percent of Tribes said a change matters a lot or is extremely important. Responses also showed that Tribes are losing their basket-making tradition because of fears of contamination when coming in contact with waters to gather the reeds and grasses to make the baskets.

In attempting to assess intangible risks and tradeoffs, researchers developed a values scale with comparisons made between different traditional practices and health or exposure. They found that Tribes valued or were more concerned about the exposure of many elders to environmental contaminants during berry-picking practices and retaining their traditions compared to non-elders having low exposure risks and also compared to having good short-term health.

In addition, the loss of traditional knowledge and elders was valued by Tribes over the pollution of a sacred site with intangible risk only, which was valued more by non-Tribal respondents. Tribes were equally concerned about non-tribal members polluting and jurisdictional issues and tribal members having regular physical exposure to a nearby open dump.

Tribes were more concerned about children playing at an abandoned building with high risk of contamination compared to elders gathering near a small dump with low risks. Non-Tribal respondents agreed. Tribes were more concerned about intangible pollution and the loss of tradition compared to physical pollution and cancer risk but with traditions continuing. Non-Tribal respondents were more concerned about the cancer risk.

The researchers have developed a computer model to estimate exposure and risk to Native Americans from chemicals at hazardous waste sites. The model could be improved to be more user-friendly and include additional characteristics of the modeled individual and the environment. This could provide default values for certain exposure factors that the user can accept or alter. The model could be made to account for more advanced exposure scenarios. Unsteady dermal absorption from the aqueous phase, dermal vapor absorption, liquid phase inhalation, and incidental ingestion of water could be taken into account.

More activity categories and exposure pathways could be added. More case examples are needed for additional activities categories and exposure pathways. A user manual should be developed highlighting additional case examples, and which assists the novice user. A technically defensible focus group should be performed along with this effort.

The computer model was called The Native American Exposure and Risk Assessment Computer Model. It was created on an accelerated development cycle and has not completed beta-stage testing. The model has also not gone through a full QA/QC software development cycle, so it cannot be distributed yet to end users. Other technical computer manipulation changes need to be made so that information on risk assessment can be saved by more than one user.

Next Steps

- The model must be made to generate a user-friendly report documenting the user, chemical, and activity information
- Updates must be made to the user interface to make the computer model more user-friendly
- Documentation needs to be enhanced to have a robust help system to guide the novice user through model usage, reducing training time for users, and
- The model should be linked with government or other chemical databases directly from the software to make input of physical and toxicological characteristics of the chemical of interest much easier for the user.

The model was developed and documented by Zender Environmental Science and Planning Services. Zender can be contacted at www.zender-engr.net.

Questions and Answers

Q – How was data obtained for the risk assessment coefficient?

A – The Tribes enter all the numbers. For example, if skin absorption of a chemical during berry picking is of concern, one would look up the chemical on IRIS and get a risk default value. Also, there are tables with different factors and gender to show how much skin is being exposed. We need to know if a person wears gloves, if both sides of the hand are exposed and whether sleeves are rolled up to expose arms, too. We need to observe how the berry picking takes place and we need a hazard index for when most of the body is exposed.

Q – How has the response been from EPA’s Office of Solid Waste?

A – EPA is initiating internal review of the model and will consult with Tribes on its use.

Q – Are you using a Lifeline approach?

A – No. Lifeline is a population-based model designed for overall population findings and does a great job for that. But our model is individual based. The values we come up with are used to help set regulations and policies for contaminants.

8 A.M., TRAINING: METHAMPHETAMINE LAB HAZARD ASSESSMENT OVERVIEW

Facilitators:

Marshall Cheung and Michele Dineyazhe

Cherokee Nation Methamphetamine

Richard Keck, Cherokee Nation, Environmental Programs, Tahlequah, OK

The Methamphetamine Lab Hazard Assessment overview is designed to educate participants on the dangers surrounding former methamphetamine laboratory sites. These illegal drug labs have created a toxic legacy of potentially contaminated properties. Communities are now forced to address the concerns associated with reoccupation and development of these sites. The course will provide insight into the identification and assessment of the various hazardous substances used to illegally manufacture methamphetamine. The course is an overview of the larger two-day Methamphetamine Lab Hazard Assessment course taught by Cherokee Nation Environmental Programs.

8 A.M., TRAINING: INTRODUCTION TO NATURAL RESOURCES DAMAGE ASSESSMENT AND RESTORATION (NRDAR)

Facilitator:

David Charters

The objective of this class is to provide participants with a brief overview of Natural Resources Damage Assessments and Restoration (NRDAR). Specific presentations will be made on the following topics:

- A brief introduction to NRDAR
- An overview of NRDAR from both a Comprehensive Environmental Response Compensation, and Liability Act (CERCLA) and Oil Pollution Act (OPA) perspective
- Trusteeship
- How the NRDAR process goes beyond the EPA’s Ecological Risk Assessment

An Introduction to Natural Resource Damage Assessment and Restoration

Dolores Savignano, U.S. Fish and Wildlife Service, Division of Environmental Quality, Arlington, VA

This portion of the class provided a brief introduction to the NRDAR process including a review of the statutes, explanation of the terms natural resource service, injury, damages, and baseline. In addition, an explanation was provided of the phases under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA a.k.a. Superfund) and Oil Pollution Act (OPA). The goal is to restore natural resources impacted by releases of oil or other contaminants and to replace services that were lost while the habitat was contaminated.

Trusteeship and Tribal Opportunities

Al Sedik, US Department of Interior, Bureau of Indian Affairs, Washington, DC

10 A.M., EARTH

Facilitator:

Patti Tyler

Emergency Preparedness & Response (aka FEMA) & the National Response Plan at the National Forum on Tribal Environmental Science

Andrew Hendrickson, CEM State and Tribal Liaison, FEMA Region X – DHS

Andrew Hendrickson spoke about the history of FEMA and the provision of supplemental federal assistance, including the role the State plays in the declaration process. He then explained how the Recovery programs help citizens through the Individual Assistance Program and jurisdictions through the Public Assistance Program. He highlighted the ability of Tribes to work government-to-government with FEMA after a declaration for a State has been made by the President. He also touched on the Homeland Security grant programs that support the process of developing response capability.

His remarks follow.

At the beginning FEMA had some growing pains. The 1990's were referred to as the decade of disaster and the NRP was developed as an effort to consolidate various response agencies. There was also a shift at the state level regarding cold war planning; because the USSR no longer existed, states could focus more on floods, tornadoes, and hurricanes. Cold war equipment and resources began to be used as a resource for FEMA disaster response and there was the first deployment of FEMA urban rescue

The National Incident Management System (NIMS) is important as it will be a requirement for a lot of funding. I encourage most tribes to look into CERT program. At the EMS institute there are three tribal programs in emergency management. I encourage tribes to become more familiar with these programs. FEMA funds cover travel and the training so the only cost is food and they can also take the trainings on-site to large gathering of tribes. You can find more information at the FEMA website.

There are ten FEMA regions and each of those regions corresponds to a varying number of states and those states are the primary organization to which the Department of Homeland Security (DHS) issues grants. Tribes need to get involved so that they can access these grant programs. Terrorist events immediately trigger federal involvement. Otherwise FEMA is involved based on state/county evaluation.

FEMA goes through county by county to determine needs and sends recommendations to the White House. At this point in the process we would also be communicating with tribes if they are affected. Because of the Stafford Act the only way FEMA can work is at the request of a governor. If a tribe is in an impact area we talk with them, usually in conjunction with the state. Public assistance is the program that is particularly of interest to the Tribes. We can help with rebuilding, removal of debris, but there are areas FEMA can't address, especially Tribal-owned buildings, such as clinics.

FEMA has a tribal policy that is mostly based on the trust relationship; the relationship requires that Tribes need to have a state level hazard mitigation plan on record to be eligible to work government-to-government with FEMA. Also, in that case funding to repair is based solely on tribal funding and if there is more damage statewide there might be greater funding opportunities that could lead to enhanced hazard mitigation.

The National Response Plan (NRP) builds on what works from previous plans and incident response but forges new approaches and mechanisms to address today's threats. The NRP addresses the complete spectrum of incident management activities and uses the NIMS to establish a framework for coordination among federal, state, local, tribal, nongovernmental, and private-sector organizations.

The National Response Plan is based upon the belief that incidents are typically managed at the lowest possible geographic, organizational, and jurisdictional level. The Homeland Security Act of 2002 and HSPD-5 required a comprehensive national approach to domestic incident management through the development of a National Response Plan (NRP) and National Incident Management System (NIMS). NIMS standardizes incident management processes, protocols, and procedures for use by all responders. The NRP establishes several program parameters:

- Federal coordination structures/mechanisms
- Direction for incorporation of existing plans
- A consistent approach to managing incidents
- Construction of the NRP, and
- NRP Applicability.

The NRP fully incorporates the following:

- Federal Response Plan
- Domestic Terrorism Concept of Ops Plan
- Federal Radiological Emergency Response Plan
- Initial National Response Plan (INRP), and
- Other national-level contingency plans.

The NRP bases the definition of Incidents of National Significance on situations related to the below four criteria set forth in HSPD-5:

- A federal department or agency acting under its own authority has requested the assistance of the Secretary of Homeland Security.
- The resources of state and local authorities are overwhelmed and Federal assistance has been requested by the appropriate state and local authorities. Examples include the following: Major disasters or emergencies as defined under the Stafford Act; and catastrophic incidents. A catastrophic incident is any natural or manmade incident, including terrorism, which results in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national morale, and/or government functions.
- For Incidents of National Significance that are Presidentially declared disasters or emergencies, federal support to states is delivered in accordance with relevant provisions of the Stafford Act.

Note that while all Presidentially declared disasters and emergencies under the Stafford Act are considered Incidents of National Significance, not all Incidents of National Significance necessarily result in disaster or emergency declarations under the Stafford Act.

- More than one federal department or agency has become substantially involved in responding to an incident, for example:
 - Credible threats, indications, or warnings of imminent terrorist attack, or acts of terrorism directed domestically against the people, property, environment, or political or legal institutions of the United States or its territories or possessions.
 - Threats or incidents related to high-profile, large-scale events that present high-probability targets such as National Special Security Events (NSSEs) and other special events as determined by the Secretary of Homeland Security, in coordination with other federal departments and agencies.
 - The Secretary of Homeland Security has been directed to assume responsibility for managing the domestic incident by the President.

In the case of a catastrophic incident the primary mission is to save lives, protect critical infrastructure, property, and the environment, contain the event, and preserve national security. Standard assistance-request procedures may be expedited or suspended. Selected federal response resources will mobilize and deploy and begin necessary operations.

Emergency Support Functions (ESFs) serve as the coordination mechanism to provide assistance to state, local, and tribal governments, and federal departments and agencies conducting missions of primary federal responsibility. ESFs provide staffing and resources for the incident management structures and may be selectively activated for both Stafford Act and non-Stafford Act incidents.

Emergency Support Functions include:

- ESF #1 - Transportation
- ESF #2 - Communications
- ESF #3 - Public Works and Engineering
- ESF #4 - Firefighting
- ESF #5 - Emergency Management
- ESF #6 - Mass Care, Housing, and Human Services
- ESF #7 - Resource Support
- ESF #8 - Public Health and Medical Services
- ESF #9 - Urban Search and Rescue
- ESF #10 - Oil and Hazardous Materials Response
- ESF #11 - Agriculture and Natural Resources
- ESF #12 - Energy
- ESF #13 - Public Safety and Security
- ESF #14 - Long-Term Community Recovery and Mitigation
- ESF #15 - External Affairs

Support Annexes include:

- Financial Management
- International Coordination
- Logistics Management
- Private-Sector Coordination
- Public Affairs
- Science and Technology
- Tribal Relations
- Volunteer and Donations Management

Worker Safety and Health
Incident Annexes
Biological Incident
Catastrophic Incident
Cyber Incident
Food and Agriculture Incident
Nuclear/Radiological Incident
Oil and Hazardous Materials Incident
Terrorism Incident Law Enforcement and Investigation

The NRP builds on what works from previous plans and incident response. The NRP represents a true "national" framework in terms of both product and process. The development process included extensive vetting and coordination with federal, state, local, and tribal agencies, nongovernmental organizations, private-sector entities, and the first-responder and emergency management communities across the country.

The NRP incorporates best practices from a wide variety of incident management disciplines to include fire, rescue, emergency management, law enforcement, public works, and emergency medical services. Collective input received from our public and private-sector partners has been, and will continue to be, absolutely critical to the implementation and continued refinement of the core concepts included in this groundbreaking national plan.

Questions and Answers

Note -- Various members of the audience questioned the issue of the presenter's focus on state rather than tribal government. There was confusion about NIMS, and concern that there is great lack of awareness of the importance of NIMS funding as a requirement to draw down funding. Even more complicated are areas where there is fee land and trust land in Indian Country. Problematic relationships between states and Tribes can also interfere with the process and documentation.

Mr. Hendrickson's Comment -- A key issue of concern was highlighted during Q&A regarding NIMS compliance. There was some confusion generated regarding the difference between federal preparedness grants and post-disaster recovery grants and their need for NIMS compliance to be eligible for these funds. Another common concern in the audience was the notion that only the Governor can request a disaster declaration and that Tribes do not have that option. Also of concern is the fact that the Department of Homeland Security has defined Tribes as a type of local government, a definition that is not consistent with Treaty-based definitions of Tribes as sovereign governments.

Comment -- I think it is a flaw in Homeland Security in identifying Tribes as a local government.

Comment -- It seems to me that each tribe should be working towards NIMS certification and should have an official representative involved. It seems that we should look at amending the Stafford Act to clarify some of these issues.

Comment -- There is an amendment to the Stafford Act right now but it doesn't mention the Tribal issues.

Q -- I'm concerned because our Tribe is not going to be NIMS compliant but what bad effects can tribes face if they aren't NIMS compliant? What funding can be cut off?

A -- There's a list on the NIMS website at www.nims.gov. It's only related to preparedness grants, but there are a number of grants tied to that. Tribal housing there can be a problem if there is an overlap in the individual/ public assistance program.

Q -- What about tribal member-owned housing?

A -- If the person is responsible for ownership of the home, then that would be under the individual assistance program.

10 A.M., TRIBAL DIET AND COMMUNITY HEALTH

Facilitators:

Curtis Munoz and Dana Davoli

Results and Discussion from the Swinomish Tribe's Toxics and Shellfish Project

Jamie Donatuto, PhD., Swinomish Indian Tribal Community, Office of Planning & Community Development, La Conner, WA

Barbara Harper, DABT, PhD., Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering, Pendleton, OR

The Swinomish Tribe is located near inner Puget Sound in Washington and has about 1,000 members. The reservation is about 7,000 acres of both uplands and tidal basin land. The community collects shellfish for subsistence and cultural ceremonies. The harvest is also sold to support families on the reservation. A four-year EPA-funded project begun in 2002 and ending in August 2006 was undertaken to test the hypothesis that the Swinomish people are exposed to low-level, chronic bio-accumulative toxics when participating in subsistence gathering and consumption of shellfish.

The study aimed to find out whether people come in contact with toxins while gathering shellfish, how to use culturally competent measures to determine exposure and to describe any resultant health problems. Targeted chemical groups for sampling included heavy metals (arsenic, copper, cadmium, selenium, mercury, lead and nickel), PCB aroclors and WHO listed congeners, PAHs (extended list), dioxins/furans, chlorinated pesticides, and butyltins (TBT).

Point and nonpoint sources of contamination were surveyed, including a petrochemical plant near the reservation. Currently, all five petrochemical plants in Washington are on Tribal reservations, creating an environmental justice issue. There is also heavy boat traffic in the area. Sample collection was primarily in the tidal basin for steamer clams, butter clams, and Dungeness crab. Tribal QA/QC protocols and methods were used to harvest the species that indicate how exposure can occur. Currently the data are being tabulated for final results.

Fish consumption is also a key factor in Coast Salish Tribal risk assessments (dose x toxicity = risk) that examine health effects from eating contaminated subsistence foods. But this risk assessment model does not incorporate Swinomish cultural specifics or consumption rates, so it was not used. The Swinomish developed its own fish consumption survey, asking individuals how much seafood is consumed and whether it is close to the U.S. national average of one serving/month. A 1994 Columbia River Intertribal Fish Commission survey did not include data on the highest fish consumers. A 1996 Tulalip and Squaxin Island Survey recoded data from the highest consumers to lower rates.

In designing the Swinomish fish consumption survey, researchers attempted to determine whether data on the currently suppressed fish consumption rates is valuable or whether data is desired on the rates of consumption promised by the original Treaties and the amount Tribes would like to be able to consume

today, according to their cultural preferences. If the suppressed data are used, the standards might be set using them and not what the Tribe actually desires. It was determined that data from the highest fish consumers should be included in the survey.

Oral interviews with open-ended questions were favored over written or computerized surveys to allow culturally significant information to be collected. Tribes were allowed to perform their own surveys. “Seafood diet interviews” rather than consumption surveys were conducted with 108 Tribal members. Before initiating the interviews, it is important to determine the questions to ask, the collection and data analysis methods, and to remember that the answers are Tribe-specific. Results from the interviews produced a bi-modal curve for those who eat less and those who consume more shellfish.

While data are currently being analyzed for the final report, some preliminary findings show that in clams the biggest cancer risk driver is arsenic, and the biggest non-cancer risk drivers are PCB congeners, then arsenic. In terms of risk assessment for clams, there were no sites sampled that were totally free of contamination (indicated in green for advisories). Seven sites were categorized as those from which only one meal per week (alone or in combination) should be consumed (orange indicator); seven sites were found from which only two meals per week should be consumed (yellow indicator); and one site where no meals should be consumed (red indicator).

For crabs, the biggest cancer risk drivers are arsenic, PCB congeners, and dioxins. The biggest non-cancer risk driver is arsenic. Risk assessment advisories are now being produced that show there were no uncontaminated sites for crab harvesting and consumption. There were five sites where one meal per week (alone or in combination) should be consumed; four sites where only two meals per week should be consumed; and no sites were found where no meals should be consumed.

The primary mitigation of the contamination is cleaning up the sites to eliminate contaminants. Due to cultural practices, an advisory cannot be made to eat no fish, simply avoiding risk. After the survey, the project managers held a traditional clambake for the Tribe, using a steaming method with hot rock layers placed among the clams and covered with sand. Researchers concluded that current assessments are not adequate because of the intangible risk and values that can’t be easily quantified. A new community-based health assessment framework or tool is needed based on health, not on illness.

Next Steps

- Develop a message using a seafood spiral that recognizes seafood use for the body and for the spirit
- Provide community outreach and education at community gatherings and youth programs
- Publish consumption information in the Kee-yoks newsletter and on the SWN96 cable TV station
- Teach video skills to youth using “Native Lens” so cultural ways can be captured by them
- Use “Tox-In-A-Box” tools to educate youth using hands-on experiments and sampling, and
- Eliminate negative media stereotypes that “all natives are drunk.”

One claymation video was developed by youth showing Columbus going “back to the future” to 2005 and seeing the contamination, then wanting to return to the 1400s. When the missionaries came to America, the native peoples knew that the earth and North American would never be the same. In addition, an award-winning, 3-minute movie was made about what kind of man or woman one will be in the community, looking at resilience and in choosing between traditional and current cultural values.

Questions and Answers

Q – How would qualitative values be included in the study?

A – A qualitative numerical scale can be used, but the fine cultural points are easily missed, like the values inherent in lifestyle choices. The Tribes are saying they need a new kind of tool, like the movie, which records values visually.

Comment – Tribes have outside agencies doing surveys on consumption. The rate of fish being consumed today doesn't reflect what it was or should be. It is important to point out that the Tribes want to increase the consumption levels of shellfish. The Swinomish are pushing for using the consumption rate at the time of the Treaties. This can be found in some ethnographic records.

Q – Can Tribes use contaminant data to influence permit decisions for industrial use and to set effluent standards?

A – This data probably will be used in the future. But there hasn't been a big problem with cleanup yet. The Tribes got one company to clean up a dump site during its NPDES review. We would rather comment than litigate. In the 1855 Treaty, the Swinomish were given land that was later taken away and industry built facilities on it that pollute.

Q – What is the source of arsenic in the study?

A – Arsenic is everywhere in Puget Sound. We don't know if it is from naturally occurring background levels or from aluminum smelting operations.

Q – Was total arsenic sampled?

A – Organic and 10 percent inorganic samples were taken. They were not species specific.

Q – In doing ethnographic research, are there protocols we could follow?

A – Barbara Harper has especially good methods. She can be contacted for information.

Q – Is there any way to reproduce the procedure or methods to get the quantitative information?

A – Most of the survey dealt with qualitative information. Past research literature has quantitative data. We went from one knowledge leader to others that we were referred to by the initial contacts until they were all identifying each other as knowledge leaders. Then we knew we had the right people to talk to. Each one verified the other in answering questions.

Polychlorinated Biphenyls in Serum of the Siberian Yupik People From St. Lawrence Island

Pam Miller, Director, Alaska Community Action on Toxics, Department of Research, Anchorage, AK

Vi Waghiyi, Project Coordinator, Alaska Community Action on Toxics, Environmental Health and Justice Project for St. Lawrence Island, Alaska and Norton Sound, Anchorage, AK

Miller is based in Anchorage, Alaska, near Norton Sound. ACAT is a nonprofit organization dedicated to cleaning up toxic chemicals in the environment. The group takes science and converts it to protective health policies. ACAT develops a list of core values to guide its advocacy and research. Project coordinators have evaluated hazardous waste sites created by the U.S. military, mining, and oil and gas development. There are over 700 military sites along the Bering Sea Coast in northwest Alaska. The sites were used for intelligence surveillance near Russia in the Cold War.

Contaminants include PCBs, heavy metals, pesticides, and petrochemicals. ACAT works with the Norton Sound community to clean up these sites, which are some of the most polluted Superfund sites in the U.S.

The region is downstream or downwind of many of the polluted sites. There is much concern about the long-range transfer or drift of the contaminants to the north because the Arctic is already a hemispheric sink for pollutants due to ocean and wind currents. The contaminants stay there and concentrate because of the cold and high fat content in the fish, other animal species, and people.

Waghiyi spoke about the Yupik people on St. Lawrence Island in the Bering Sea and several villages including Gambell, Savoonga, and Northeast Cape. There are 1,500 native people left on the island. They hunt whales, walrus, seal, birds, and fish and eat plants and berries, which grow there. They use seal skin to make boats to hunt and for clothes and carve ivory from the walrus tusks. The Tribe was fortunate to avoid cultural change when the area was settled by missionaries, because it is somewhat isolated geographically. Also, the native language is difficult to learn.

One woman named Annie Alowa began seeing high cancer rates among the people who were normally very healthy due to a vigorous way of life. She also observed low birth rates and miscarriages. She tried for 20 years to get help from many different agencies with little success. At Gambell, there is a military base with buried material. At Northeast Cape, once a very clean area with lots of wildlife, there was a military air base.

ACAT, a nonprofit organization, has gained the trust of the people living there to address environmental problems by using interactive studies and working with city councils and other organizations locally. In the past, people from the outside would come to take blood and hair samples. They were never heard from again. Studies are being undertaken now to improve the contaminated sites. A current project has several primary aims:

- Hire and train local people and community health workers
- Create programs that residents can understand regarding the dangers of pollution and the food they consume, and
- Address prevention and treatment of environmental health problems.

“The military left a big mess in this area. My people are dying of cancer. They didn’t drink alcohol or smoke,” Waghiyi said. Newspaper articles started generating stories several years ago about PCBs found in university studies. Waghiyi said she doesn’t have a university degree. She works from her heart regarding the injustices passed on to her people. She worked with the State University of New York, which had interacted very well with the Mohawk Nation, to determine the level of chemical contamination in the area.

A study examined global sources of contamination from the military and took samples from birds, eggs, the air for PCBs and groundwater for VOCs, the surface water, plants, soil, and sediments in the river at the military site near Northeast Cape. Plants that are edible traditional food sources were sampled also. A detailed community health survey was given to about 250 respondents. The sediment cores helped date the time of contamination and correlate with the time that the military bases were in operation.

Mercury was found in sediment core samples with peaks occurring when the military had a lot of electrical equipment in use. At Northeast Cape the PCB levels were found to be similar to those in heavily industrialized areas. Even though these are old sites, they are like active ones today because there is so much pollution still occurring. People fish near there and breathe contaminated air. PCBs attach to dust particles, which blow about on a windy day.

MIREX, a flame retardant, was found in the sediment, air, biological samples, and in people's blood samples. PCBs were found on edible plants and berries like roseroot and arrowroot. These levels can be lowered somewhat by washing the plants. PCBs are a concern because they are carcinogenic and cause neurobehavioral problems. Chlorinated biphenyls and DDT are still accumulating in the Arctic. The people decided that they wanted their own blood serum levels checked for contaminants. High PCB levels were found in human samples at all the communities, with 9,000pg/g at Northeast Cape, 7,500 pg/g at Savoonga and 6,000 pg/g at Gambell. The PCB level for people in the lower United States is about 1,000 pg/g.

Older people have the highest concentration levels. PCBs are also being passed on to the younger generation. There are specific patterns of congeners that people retain from past exposure. There is also a high percentage of chlorinated congeners, indicating recent exposure. Some congeners are transient in the body, but leave behind their effects while in the system. At Gambell, the pesticide DDE, once used by the military, was also found in human blood levels. New data show that Chlordane is still showing up at eight to 10 times the levels found in people in the lower U.S. Chlordane was not used by the military, but Lindane and DDT were.

In summary, Norton Sound has 30 defense sites where the contamination effects need to be analyzed, but the military is secretive. There are also some radioactive and chemical warfare agents that have been dumped at the military sites. In trying to use the scientific data to form policy, ACAT is trying to get toxic chemicals banned. They are working with the Stockholm Convention (150 governments and 50 Tribes) to get bans through the United Nations. There were 12 chemicals originally named by the Convention for which bans would be sought. More chemicals are being added currently.

Next Steps

- Get entire families of chemicals listed for bans, not just single chemicals, which is too slow
- Identify the communities with the highest concerns and get resolutions from them for bans
- Get permission from the natives to sample
- Have the elders help design interviews and surveys of the air, water, groundwater and soil samples
- Interview the elders for their knowledge of the military operations in the past
- Push for residential cleanup standards, and
- Advocate for landfill and groundwater cleanup.

Annie Alowa died of liver cancer. She is featured in two video programs, "I Will Fight Until I Die" and "If You Are Not Our Enemies, Then Help." There have been many injustices from the Department of Defense to people of color and those with low incomes. Waghiyi also works with women on a study to sample breast milk and a newborn's first meconium. The women welcomed the study. The U.S. Army Corps of Engineers' cleanup of some of the sites was only six inches of soil removal. The military representatives call us alarmists and say that the PCB levels in our people are safe.

Questions and Answers

Q – Has research been done on detoxifying the human body of these chemicals?

A – We have not done research on this, but have used our traditional ways of healing and detoxifying the body. The "Health Med" program from California has been effective in detoxifying children in the

Chernobyl disaster and the people who worked to clean up the World Trade Center site. Sun, exercise, and good nutrition are needed for at least six months.

Q – Is the Public Health Service (PHS) doing anything to help?

A – No, but it is a good idea that we work with them.

Q – If the Department of Defense is turning a deaf ear, what about working with a Congressional delegation?

A – Waghiyi was in Washington D.C. in May to work with the Stockholm Convention. A delegation may go to Washington to work on the defense budget -- \$86 million is needed to clean up the area. The Tribal restoration advisory board needs to be revitalized as well. The Corps is less hostile now and they use some of Tribal data.

Q – Is the Russian side of the Bering Sea contaminated?

A – There is not as much research on this area, but efforts are underway through the Arctic Monitoring and Assessment Program.

Comment – The U.S. and Russia partner through the International Bering Sea Forum for stewardship of the Bering Sea. They want to document the occurrence and use of mustard gas by the military and radioactive material from decommissioned submarines. Estimates have been as high as 30,000 to 60,000 chemicals that were being used. Only 1,000 have been studied. We also need to look at the interactions between the chemicals.

There are TUMS, aspirin, and hormones in the North Atlantic. There are 85,000 chemicals produced in the U.S. Less than 10 percent have been tested for toxicity. We must address chemical classes, not just analyze one chemical at a time. It's too slow. Countries in the European Union are more progressive. A group called "Coming Clean" in the U.S. works on banning chemicals. Working first on the state and local level is effective to ban classes of chemicals more quickly.

Procedures under the federal laws passed in the 1970s are too onerous to get chemicals phased out. Use of local ordinances can be effective to address national and global problems. Science doesn't give us all the answers. We need the "body of evidence" to support it. For a reprint of the data on contaminants, contact Vi Wahhiyi at ACAT, 505 W. Northern Lights Blvd., Suite 205, Anchorage, AK 99503 or call 907/222-7714.

10:00 A.M., TRAINING: METHAMPHETAMINE LAB HAZARD ASSESSMENT OVERVIEW

Facilitator:

Marshall Cheung and Michele Dineyazhe

Cherokee Nation Methamphetamine (continued)

Richard Keck, Cherokee Nation, Environmental Programs Group, Tahlequah

10:00 A.M., TRAINING: NATURAL RESOURCES DAMAGE ASSESSMENT AND RESTORATION

Facilitator:

David Charters

Differences Between CERCLA Remediation and NRDAR Restoration

Mark Huston, U.S. Fish and Wildlife Service, Division of Environmental Quality, Arlington, VA

An explanation of the differences between the two processes, how they relate, and the benefits of working together will be discussed. In addition, an explanation between CERCLA risk assessment and NRDAR injury assessment will be provided.

Restoration

Dolores Savignano, U.S. Fish and Wildlife Service, Division of Environmental Quality, Arlington, VA

A discussion of issues relevant to restoration including, public involvement, options for implementation, and monitoring.

Coordination of Trustees and Response Agencies: Case Studies

Mark Huston, U.S. Fish and Wildlife Service, Division of Environmental Quality, Arlington, VA

Several case examples such as St. Lawrence River were discussed that highlighted the coordination between trustees and response agencies. Most of the interest from the class focused on the Tribal Opportunities and Coordination of Risk Assessment and Damage Determination. Questions generally fit into two categories: One was how the damage assessment regulations apply to tribes and the second was how to place a value on cultural resources for the purposes of restoration. In future presentations it is recommended that a Tribal representative present information as well.

CLOSING PLENARY SESSION

Facilitator:

Claudia Walters, EPA, Office of Research & Development (ORD), Sustainability Programs, Washington, DC

How to Take Action to Protect the Environment

Claudia Walters provided the following remarks:

EPA has a history of many environmental improvements with policies and programs to address issues. We did do something right, with others helping. Laws have been passed and implemented. We don't have rivers on fire or drums with toxic chemicals being buried anymore. Restoration activities have resulted in the bald eagle being removed from the threatened and endangered lists. But the world is changing from local issues to global impacts on our natural resources. We need to define the scope and depth of the problems to solve them.

Regarding global climate change, the earth's surface temperature has risen one degree in the past century. There is much evidence in the polar ice core samples that shows the release of carbon gases has risen by 35 percent in the past century. The changes are most evident at the Poles, but the emissions don't originate there. Arctic temperatures are rising at twice the rate of the rest of the world in the last 10 years. There are risks to both plants and animals. The polar bear population is declining. Without a food source, we are seeing cannibalism among bears.

Tribes tell us that tree lines and migration patterns are changing. People generally don't realize the depth and scope of the problem. The ocean is a sink for carbon dioxide. The water is more acidic and warmer

now, actually causing the bleaching of some coral reefs. All of this is driving the changes in our weather patterns and the severity of storms. Wildlife habitat is fragmented. It is affected by pollutants and invasive species. Even the bees and flowers are affected.

Across the U.S. there is an increase in cancer, heart disease, and diabetes in an overweight population. Asthma is increasing among children. Mental health problems, especially depression, are more common, with one in five people affected. There has been an increase in crime and school violence. One recent study showed that money doesn't make people happy. Happiness depends on personal relationships.

As our population increases, we are consuming more land and more energy. Charleston, S.C. has experienced a 50 percent growth in population in recent years and a 250 percent increase in urban sprawl. Environmental, economic, and social problems are increasing. Tribes are experiencing many natural resource impacts. However, the federal government, according to U.S. Comptroller David Walker, says the decrease in funding for programs will worsen in the future.

Clearly, we need to do business differently. The news media is doing a good job of getting the message out to the mainstream population. *Time Magazine's* article, "Be Worried, Be Very Worried," about global climate change, as well as *National Geographic* and *Vanity Fair* stories give us hope for sustainable programs. Al Gore is emerging as an environmental leader.

We need a national model for cultural sustainability. Risk assessment is the current way we make decisions for science and policy, but it's not enough. While EPA will keep that tool, we need to incorporate social and cultural perspectives for individual communities. We need a model for sustainability that addresses all of the relevant issues. We have looked at the environmental impacts, but we need to look at the economic and social impacts, too. We need to look not at just one year, but multi-year data.

The issues are not linear, but holistic, integrating all aspects of life. ORD has a sustainability research program. The Tribal Science Council has a paper on traditional lifeways to develop a life-giving paradigm with respect for natural law. Our designs for solutions must be culturally-based to be meaningful for people. We must come to the table and have a collaborative effort for planning and decision-making, with a long-term view. The issues are complex. We need to move now and work together multi-laterally to develop global solutions.

A Global Environmental Perspective Symbolized by the Tribal Treaty Belt

James Ransom, Tribal Chief, St. Regis Mohawk Tribe, Akwesasne, New York

Chief Ransom's remarks are summarized below.

The St. Regis Mohawk Tribe is located in eastern New York State and in Canada.

When looking at the global perspective, skin color doesn't matter as an indicator of how committed you are to finding solutions. We must look outside the box.

Our Treaty Belt (displayed) was one of the first agreements made with outside peoples. There are two parallel lines of purple wampum beads made from shells with a band of white wampum beads between them. The purple lines signify two vessels on the same river (white beads). The vessels are side by side and must help each other down the river.

One purple line represents the Iroquois Confederacy and the Mohawk Tribe. The other line represents the people we have a treaty with. Once, one line symbolized other native peoples and the other the French and the Dutch. The Treaty Belt explains the importance of the relationship between the two parties as co-equals in partnership, brother-to-brother. The two vessels are on one river that they must share.

Also on the Treaty Belt there are three rows of white beads – these stand for the principles that define relationships – peace (respect), a good mind (equity), and strength or the power of a good mind (empowerment). These are the principles needed to take action. We need good communication between the two vessels. We will have some differences, but a “good mind” means that we acknowledge them and work to overcome them. Strength comes from following the first two principles. We will mutually co-exist as we travel the river together. We will keep the peace, use a good mind, and that gives us a strong relationship. We will help each other on the journey from time to time.

The Treaty Belt is a good way to talk about the EPA and Tribal relationship. One row of purple beads is a birch bark canoe representing the Tribes. The other row of purple beads represents the ship of the EPA. Both share one river that we must ensure is there for the future.

Today the health of the environment is threatened. Historically, there has been a problem in the EPA-Tribal relationship because of the need by EPA to follow rules, policies, and procedures. EPA has expected the Tribes to follow the same procedures. EPA has done valuable work, and was the first federal agency to have a government-to-government policy of working with the Tribes, unlike the Bureau of Land Management (BLM).

We have established native environmental offices, and funding has been given by the government. But in the process of helping the Tribes, EPA has wanted us to follow their ways. This creates mini-EPA offices among the Tribes, but misses the opportunity for Tribes to bring their perspectives on the issues. We have our own science rooted in thousands of years living on the land. As medicine people, we notice first the changes in the environment and feel the impacts first-hand.

We know that the natural laws take precedence. The canoe can help the ship. When there was a disease outbreak and Navajo people were dying, we called on the ship to help, but they couldn't. The Center for Disease Control (CDC) asked the Navajo for help with information about the environment. EPA was told that it had rained a lot that year, and the nut trees were producing a plentiful supply of nuts. This food supply in turn increased the population of deer mice. The ship tested mice droppings and found the mice were carrying a virus (the Hanta Virus).

Sometimes western science is not enough, and Tribal knowledge is not enough. But when the ship and the canoe work together, problems are solved. Once, when testifying about toxic contaminant levels, I asked the industry representatives and the EPA this question: What do you do when your mother has cancer? Do you remove the lump or put a Band-Aid on it? You must remove it.

Earth is our mother. A toxic dump is a lump on her breast. You can't cover a toxic dump with a Band-Aid. You must remove it. Tribes have been advocating for years for this kind of paradigm of health and well-being. EPA now appears to be listening to the Tribal Science Council.

A Tribal Approach to Environmental Issues

Terry Williams, Tulalip Tribe, Director, Fisheries Department

Mr. Williams was the first director of the EPA Environmental Indian Office and has been employed by the Tulalip Tribe for 25 years. He gave the following remarks.

Cultural sustainability is very important to think about for the Tribes in the next 100 years. In the last 100 years, there have been devastating changes to the land and the people. We must understand the past to help with the future.

In a salmon recovery assessment program, there was habitat description data going back only to the 1930s. There is no baseline data showing what the environment was like before impacts occurred. So the Tribe has to be creative. The population will double in the next 20 to 25 years. Climate change means there will be impacts to the micro-climate. When a micro-climate model for a watershed was run, we discovered land use impacts from forestry, agriculture, and urban development.

The Quinault Nation has been called “the salmon people” for the last 10,000 years. The Tribal Science Council was told that the culture may not be sustainable due to loss of the species. Different models show that salmon will be extinct in Washington in the next 25 years.

Other issues we face are wildfires in California that are the size of the City of Chicago. The intensity and range of hurricanes and tornadoes has increased. Water will be a driving issue for the environmental sustainability of human life. In talking to non-Indians and other governments, I try to explain how the environment is changing. There is a fabric woven by the environment with all the species dependent on it.

The trees, plants, and animals all live on the land and have life and are our brothers and sisters. There are relationships between each. They all interact with each other. Deer waste becomes nutrients for the trees, plants, and mushrooms. The trees drop fruit to help us sustain life. All the jobs are genetically imprinted in each species at birth. But we’re not paying enough attention to the natural laws.

Plant and animal species must fulfill their purpose. They have no choice. The beaver creates a pond without going to school. It is born with an engineering degree. There were 400 million beavers in the U.S. at one time. Now there are 10 million. This tells us we’ve degraded the environment so that tractors can drive on it and plant corn and developers can build homes.

If there is too much degradation, it punches holes in the fabric of the environment. A climate model shows the loss of up to 30 percent of the groundwater. In 25 years the loss could be 50 to 60 percent. We won’t be able to support human, plant and animal populations, or the ecosystem. The ecosystem is too complex to repair. We must use science and traditional knowledge to address the problems.

We must look back at what types of species were here before the degradation. We must start putting those species back and let those creatures do the work. They know what to do to heal the earth. We must show respect for their jobs. Our people knew at treaty time that everything would change and be wasted. We know something you don’t. To establish an air quality baseline, we have to ask what it looked like 100 years ago.

What can we expect in the future? Species will move out of our boundaries due to temperature changes. We have to figure out what to do soon. We need to put back native grasses and understand the tipping point for the earth. NASA gives us 10 years before the point of no return. We must do things beyond our imagination and be stronger than we are now. There is no more time for studies anymore. We just need to take action and do the work and rely on each other.

Haudenosaunee Environmental Protection Process (HEPP): Applying Traditional Teachings to Protect the Natural World and Promote a Sustainable Society

Mary Arquette, Mohawk Tribe, Akwesasne Task Force on the Environment (AFTE) and the Akwesasne Freedom School, Rooseveltown, NY

Ms. Arquette is a field and lab technician who has worked in projects to rehabilitate wildlife populations, and is now working with children in pre-school through 9th grade to convey traditional tribal ways and to protect the environment. Her Mohawk name means “the leaves are flying,” so she uses her body in physical movement while she speaks. There are six nations in her region, which work together to solve environmental problems through HEPP and to interface with other states and countries.

With HEPP, the tribe’s own research and knowledge of tribal ways has been used and integrated, not just the research from EPA. An important limitation on the process and project work is in the area of finding funds to hire individuals to help restore the traditional lifeways and teachings of the Tribe. There are very few people left who have this knowledge to impart to the younger generation. It is also difficult to find people who know the language of the people and are also good at the scientific technical skills needed. Those with the most traditional knowledge are over age 50 and are in poor health.

In order to bring together the environmental health issues of all the Nations, including chemical contamination, cumulative impacts, and different cultural ways of doing things, the ATFE Culturally-Based Health Model is being used. Existing models weren’t appropriate because health is not just the absence of disease, but is an entire, holistic approach to life. First, project coordinators examined traditional teachings, which produced three concepts for the model to relate the concept of human health to the natural world: wholeness, good relationships, and survival.

Interviews were conducted with many tribal members about what makes people healthy. Both Mohawk and English languages were used, and people were approached in their own oral tradition. They were encouraged to say as much as they desired about the concepts and a holistic lifestyle. Interviews focused on how the people face challenges and concerns about their resilience when they have to deal with so many pollution factors simultaneously, and industry often won’t admit to causing an environmental problem.

People were asked what makes a healthy person, physically and spiritually. Responses focused on the mind being where the spirit lives to provide the calmness and tranquility needed to function in a healthy way. All agreed that we are dependent on the natural world, so habitat preservation is critical. Many discussed the strength of working together, beginning with the individual and expanding to relationships with the family, the clan, the nation, the United States, and other nations.

A great deal of time and effort was spent on the oral interviews. Working with children in the school is seen as especially important -- though one of the most difficult challenges due to current obesity problems, children’s lack of sleep and focus, or peace of mind. A great diversity of life activities such as cutting wood, preparing food, raising animals, and trading were seen as very important cultural practices that need to be restored. Project coordinators are working to develop a process with key cultural practices integrated to give a comprehensive, holistic protection process that focuses on the “health of the natural world.” HEPP also allows the integration of western environmental monitoring techniques as required.

Training youth in traditional ways is difficult. Because fish advisories limit fish consumption, a large part of the traditional diet and even spiritual practices of the people are lost or limited severely. In the school lessons, children are being taught about the human relationship with the natural world and what sustains

humanity. Initially, teachers had to be trained in these cultural ways so they could impart them to children. Hands-on teaching methods are used because children are visual learners.

Teachers interact with children to show them how to fish, for example. There is a great amount of traditional knowledge to impart. There is much to share and learn, and not a lot of time. The Mohawk language is not easy to learn. Linguists tell us that indigenous languages are some of the most difficult to learn. Lessons about food must impart different uses, both for consumption and for medicinal use. There is a protocol for every activity, like the washing of corn with ash to keep it sacred and then preparing it to eat.

There are legends of the plants that must be passed on. Some traditions have not been practiced in a long time. It is important to EPA that we justify everything we are doing in a study or project. This is a challenge for us. We can only do our work well if we know where we came from, where we are going and why, and that we all carry burdens. Now our river is in trouble, and we must find a way to work together to assure a future for the coming generations.

It's like a ship (EPA) and a canoe (the Tribe) are traveling together down the river, and each vessel has all our knowledge in it. Our ancestors decided just to co-exist with the Dutch, but now we must work together. Our canoe has taken a real beating from the ship, with much oppression along the way. We must have time to rebuild our canoe and re-educate our children on lifeways. With limited time, we must focus on where to put our effort – on the canoe with all the native species and on the language with our children.

The Lifestream Principle

Preston Hardison, Tulalip Tribes, Natural Resources Program, Tulalip, WA

Mr. Hardison provided the following remarks.

The Lifestream Principle is an indigenous concept that explains how we are all tied together by mutual obligations in the river of life. Indigenous people want to get across this concept, at the international and national levels, that each of us has an obligation and responsibility as a result of the river's flow – of animals, people, law, resources, and pollutants. Cooperation is necessary because every action affects every planetary inhabitant.

The Declaration of the Rights of Indigenous People, approved just two weeks ago, now makes traditional knowledge an object of international law under the United Nations (UN) environmental, cultural, human rights, and economic systems. Indigenous peoples are using the UN system to reinforce the recognition of their rights but there are some concerns about this approach, because although the United States recognizes its indigenous people as sovereign, the UN does not.

The Tribal/ National relationship acknowledges that indigenous property includes traditional knowledge and indigenous cosmology and that the use and expression of these properties is based on Tribal self-determination within territories. Article 8(j) of the Convention on Biological Diversity (CBD) states that traditional knowledge shall be respected and protected. Currently, the CBD is being interpreted so that the traditional knowledge and cultures of Native Americans can be respected, preserved, and maintained. Access and benefit-sharing are being debated at this time. Sharing has to occur, but in a very careful and respectful manner. Under the Free Prior-Informed Consent rules, protection for tribal resources and knowledge is being secured; tribes hope to be able to decide who gets access to tribal knowledge and on what terms. Traditional knowledge should be protected, but not necessarily in the same manner as scientific knowledge.

The West tends to treat traditional knowledge as “folklore” which is considered to be in the public domain. Indigenous peoples see knowledge as a gift of the creator. The knowledge is not kept secret, but tribes understand that to have this knowledge is a responsibility and that they are obligated to be the guardians of the knowledge. These guardians do not have control over this knowledge as intellectual property in the Western sense. Under tribal law, however, this knowledge is not considered public domain. When knowledge escapes the tribal boundaries it does not escape ownership of the tribe, according to tribal law.

The need to find ways to use traditional knowledge is urgent. Traditional knowledge is necessary to heal our earth; the scientific, spiritual, and tribal aspects must come together. Tribes should commit to work with the government to use traditional knowledge to help solve environmental problems. The information must be shared widely and efficiently but simultaneously be protected. The government must understand that some knowledge is tribal sacred knowledge that cannot be shared. Indigenous people want to share the knowledge they can, but they also do not want it to be misused. It must be shared in a sensible manner. Governments must be educated to understand that according to tribal law, there is some knowledge that it is forbidden to share.

The Tulalip Tribes Cultural Stories Project is an information management system with more than 250,000 materials related to traditional knowledge and biodiversity. Primary traditional knowledge is *not* shared or available publicly on the system. Information that is shared is linked and searchable by categories and includes stories gathered from elders, information about people, countries, some cultural practices, projects, events, organizations, species, acronyms, resources, laws, and geographic areas.

This database is available at <http://www.culturalstories.net>, where there are additional links to literary sources and resources, relevant organizations, and papers published by indigenous groups. A climate change website also is being constructed at <http://native.climatecommons.net>, which will collect stories about the effects of climate change on indigenous peoples. A library connection catalog software called BookWhere is also a useful tool.

One of the goals of such systems is to make useful information and data simpler to find and work with. This might make it possible to get more young people involved in some research projects, an important issue throughout Indian Country. Good data exchange standards would help everyone to start sharing information that can help people respond to some of the serious problems we all are facing – for example, the impact of climate change.

Questions and Answers

Q -- Dr. David Macarus, EPA Region 5, asked Mr. Williams what EPA and tribes could do together to handle climate change and on which items focus should be placed to make a difference?

A -- Williams responded that the water cycle is a good place to start. Technology has evolved so that most people have forgotten natural processes. Remembering the natural processes and cycles would be helpful. Examples include a project in which dairy farmers are taking cattle waste and using it to generate electricity. There also is a new technique from Japan regarding the biofiltration of water. These new technologies allow more biological alternatives that will decrease dependence on coal and oil. He also said that it is time for the Indian voice to be heard regarding changes in the environment that other Americans have not seen. EPA and tribes can educate together, sharing environmental and traditional knowledge.

TSC CLOSING REMARKS: Summary of Conference, Future Tribal Science Priorities and Goals, and Final Comments

Roland Hemmett, TSC Agency Co-Chair, US EPA, Region 2, Edison, NJ

David Nelson, Tribal Science Council (TSC) Tribal Co-Chair, Director, Department of Environment and Natural Resources, Cheyenne River Sioux Tribe, Eagle Butte, SD

Dr. Hemmett explained that the Tribal Science Council (TSC) was formed in response to a request in 1999 from the National Tribal Caucus that a council be formed to provide a cross-agency (i.e., ORD and EPA Regions) forum to discuss national tribal priority science issues and identify the most appropriate ways to address these issues. The TSC coordinates with the National Tribal Caucus to integrate science priorities into the EPA's annual planning and budget process. The TSC is comprised of scientists educated in Western science as well as those trained in the tribal traditional knowledge that is vital to addressing environmental issues to protect the health of tribal communities.

Tribal representatives identify the science priorities of the TSC, which is comprised of EPA representatives from each program and regional office and a tribal representative from each region. The TSC is tribally driven, but a collaborative effort; EPA and tribes work together to develop solutions. Tribal representatives in each region determine tribal priorities and the National Tribal Caucus endorses a national set of tribal priorities. The TSC then directs the priorities to the appropriate EPA program or region and develops collaborative approaches to addressing the scientific issues. EPA may provide additional input based on its own advisory committees. The development of these priorities allows an understanding of tribal issues and related EPA activities, the development of collaborative solutions, and consideration of the Agency's planning process.

The most critical issue identified by the tribes is tribal traditional lifeways. Tribal traditional lifeways encompass the unique cultural, spiritual, economic, and language practices pursued by tribal communities and must be included in the risk assessment process. Additional priorities, each equally important, include the following:

- Endocrine disrupting chemicals
- Dioxin and dioxin-like compounds
- Persistent bioaccumulative toxins source reduction
- Pharmaceuticals in wastewater
- Habitat loss
- Environmental triggers for respiratory distress with special emphasis on mold
- Contaminated precipitation, and
- Biological stressors.

For each priority, exposure and impact risk, education, research, environmental justice, and restoration are considered. The next step is to work internally with program offices and ORD to address these issues by involving the EPA program office TSC representative with the program office tribal coordinator.

In terms of tribal traditional lifeways, risk assessment, and health and well-being, workshops to gather issues and ideas from tribal representatives and risk practitioners have been conducted, and a paper summarizing the perspectives of tribal representatives and risk practitioners has been developed. Because EPA's current decision making processes are more relevant to urban settings and not tribes, tribes have requested that EPA integrate tribal traditional lifeways into its current risk assessment policies and procedures and develop a new concept for environmental decision making that focuses on human and ecological health and well-being.

The short-term strategy includes increasing educational opportunities for tribes about EPA's risk assessment process, educating EPA about tribal values and culture, and outreach to tribes to encourage their involvement. Data collection will incorporate tribal traditional knowledge and qualitative data. Data will be collected appropriately at tribal sites, and tribal data will be tested for quality assurance. EPA will be sensitive to unique tribal features and exposures. The long-term strategy includes developing a new paradigm that integrates culture, lifeways, well-being, and the environment with risk prevention. The EPA Science and American Indians website <http://www.epa.gov/osp/tribes.htm> is a good informational resource on this topic.

Mr. Nelson thanked the sponsors for their support and the approximately 310 attendees for their participation in making this a successful conference. The TSC received many informative comments throughout the meeting and will be able to gain perspective on the important issues and needs at hand.

A participant thanked the TSC for its efforts in conducting this workshop and commented that the environmental challenges facing humans have been like a puzzle with a piece missing, the piece being thousands of years of indigenous knowledge. Now that the indigenous voice is being heard, it is possible that the ship and the canoe can come together and action can be taken.

KEYNOTE SPEAKER

USGS Tribal Partnerships

Dr. Cindi Barton, Director, USGS Water Resources Science Center, Tacoma, WA

Dr. Barton is Director of the USGS Water Resources Science Center. Her presentation highlighted a number of cases illustrating successful models for partnership between USGS and Tribes in the area.

The United States Geological Survey (USGS) is a 127-year-old Bureau within the Department of Interior. It is a non-regulatory agency whose mission is to collect, analyze, and share impartial, natural science data and information. The USGS serves the nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

The USGS works in partnership with approximately 185 Indian governments. In Washington State, USGS is working with 21 Tribes. What follows is a description of three model USGS/ Tribal Projects in the Water Program:

- Confederated Tribes of the Colville Reservation
 - FDR Lake Roosevelt
- Yakima Nation
 - Groundwater in the Yakima River Basin and its relation to the surface water resources
- Northwest Indian Fisheries Commission
 - Tribal Assessment of Water Resources in Western Washington

Lake Roosevelt is a 135-mile-long reservoir in northwestern Washington formed behind Grand Coulee Dam in 1941. The lower reach extends from the dam to the confluence of the Spokane River, and the middle reach extends from the confluence to Marcus Island. Over time, fine-grained sediment has accumulated at the bottom of the lake, forming a record of deposited layers. It is the largest reservoir within Columbia Basin Project, over 9.5M acre-feet at full pool and about 151 miles long. The upper 15-20 miles are often free-flowing.

In 1999, the Confederated Tribes of the Colville Reservation petitioned EPA to list the lake as a Superfund Site. Although EPA eventually conducted a Site Investigation (in 2002) that scored high enough to list the Lake on the Superfund's National Priority List, this was not done. In 2002 USGS scientists took cores of fine-grained sediment from six sites in the middle and lower reaches of Lake Roosevelt. Scientists collected the cores to examine the sediment record to see how trace element concentrations varied through time.

Microscopic and chemical analyses show that slag particles found in some sediments showed signs of weathering and breaking down, demonstrating that slag is not inert. Elevated concentrations of arsenic, cadmium, copper, lead, mercury, and zinc occurred throughout much of the accumulated sediments. Concentrations varied greatly within the sediment core profiles, often covering a range of 5 to 10 fold. Trace-element concentrations typically were largest below the surficial sediments in the lower one-half of each profile, with generally decreasing concentrations from the 1964 horizon to the surface of the core. The trace-element profiles reflect changes in historical discharges of trace elements to the Columbia River by an upstream smelter.

All samples analyzed exceeded clean-up guidelines adopted by the Confederated Tribes of the Colville Reservation for cadmium, lead, and zinc and more than 70 percent of the samples exceeded cleanup guidelines for mercury, arsenic, and copper. Although 100 percent of samples exceeded sediment guidelines for cadmium, lead, and zinc, surficial concentrations of arsenic, copper, lead, and mercury in some cores were less than the sediment-quality guidelines.

Trace elements observed in accumulated sediments in the middle and lower reaches of the reservoir are more likely due to the input from liquid effluent discharges compared to slag discharges from the upstream smelter. Selected samples were analyzed for the presence of metallurgical slag, a trace element-rich byproduct of metals smelting processes, which was discharged into the Columbia River by a smelter in Trail, British Columbia, upstream of the reservoir prior to 1995.

Slag, while common in the uppermost reaches of the reservoir above river mile 720, may be present only in minor amounts in sediments of the lower and mid reaches of the reservoir. Trace elements in sediments in the lower and mid reaches of the reservoir are thus largely due to the liquid effluent discharged to the Columbia River, which can easily be transported the length of the reservoir. Relative concentrations of trace elements in the cores from those reaches of the reservoir resemble relative loading of trace elements from the liquid effluent, further supporting that conclusion.

Studies results indicated:

- Elevated concentrations of arsenic, cadmium, copper, lead, mercury, and zinc in sediments throughout the reservoir
- Concentrations of most metals decrease down-reservoir
- Slag is found in sediment, especially in the upper reservoir
- The slag is not chemically stable as originally reported by Teck; it geochemically weathers, releasing metals to the water column
- Copper, manganese, mercury, selenium, and zinc were found in walleye, trout, and smallmouth bass
- Only mercury were found at concentrations of concern to human health, and
- Cadmium, copper, lead, and zinc were found in fish liver tissues but no physiological effects were noted.

Decades of liquid effluent from the Teck-Cominco smelter is the primary contributor of the large concentrations of pollutants found in sediment samples from the middle and lower reaches of Lake

Roosevelt. Teck Cominco is a mining company headquartered in Vancouver, Canada. The company is one of the largest producers in the world of zinc and metallurgical coal. It also produces copper, gold, and other metals. The Tribes, State of Washington, Department of Interior, EPA, and Departments of State and Justice negotiated with Teck Cominco to carrying out a Remedial Investigation and Feasibility Study (RI/FS), with EPA oversight and technical review by the Colville and Spokane Tribes, the State, and six DOI agencies.

The **Yakima River** flows 215 miles from the outlet of Keechelus Lake in the central Washington Cascades southeasterly to the Columbia River, draining an area of 6,155 square miles. The Yakima River Basin is one of the most intensively irrigated areas in the United States. Population in the Yakima River Basin was about 238,000 in 1990.

The surface water in the Yakima River Basin is under adjudication and it is not known how much is available for appropriation. There are increasing demands for water for municipal, fisheries, agricultural, industrial, and recreational uses that must be met by ground-water withdrawals and/or by changes in the way water resources are allocated and used. Ongoing activities in the basin to enhance fisheries and to obtain additional water for agriculture may be affected by ground-water withdrawals and by rules implemented under the Endangered Species Act for salmonid fish. An integrated understanding of the ground-water flow system and its relation to the surface-water resources is needed to implement most water-resources management strategies in the basin.

In cooperation with the U.S. Bureau of Reclamation, the Washington Department of Ecology, and the Yakama Indian Nation, the USGS is studying the ground-water system in the Yakima River Basin and how it interacts with rivers and streams in the basin. The study includes data collection, mapping of hydrogeologic units and ground-water levels, and a computer numerical model to bring together all the information.

Under Tri-Party Agreement, the objectives of the study are to describe the ground-water flow system and its interaction with surface water, and to integrate this information into a water-resources management tool--a numerical model. The improved understanding of the system can be used to describe concepts to laypersons and to guide and support actions taken by natural-resources management agencies. The numerical model will be an integrated tool for daily to long-term water-resources management and for testing potential management strategies.

The study will be conducted in three phases. The first phase includes (1) project planning and coordination; (2) gathering, compiling, documenting, and assessing available data; and (3) collecting initial data. The second phase consists of data-collection activities to support (1) mapping of hydrogeologic units; (2) estimating ground-water use; (3) developing estimates of ground-water recharge; and (4) constructing maps of ground-water levels. Together, these four work elements provide the information for an overall description of the ground-water flow system and the building blocks for the hydrogeologic framework. In the third phase, a numerical model or models will be constructed of the ground-water flow system to integrate the available information. The model will be used to gain an understanding of the flow system and its relation to surface water, and to test management strategies. The model will be available for public use.

Additional components of the study include the following:

- Well information
- Mapping hydrogeologic units
- Estimating ground-water pumpage
- Estimating ground-water recharge

- Analysis of GW/SW interchanges
- Mapping/assessment GW levels
- Estimating hydraulic characteristics of hydrogeologic units, and
- GW flow modeling/assessment.

Project Funding is a one-third split among USBR, Ecology & USGS. Direct Services are provided by the following organizations:

- Yakima Nation
- BIA
- Municipalities
- Irrigation Districts
- Conservation Districts, and
- Washington State

USGS and the **Northwest Indian Fisheries Commission** (NWIFC) developed a scientific framework for a comprehensive assessment of tribal water resources in western Washington. Water resources are essential to Native American Tribes in western Washington for instream and out-of-stream uses. As the demand for water across the region increases, western Washington Tribes need critical information about water availability, water use, and ecological needs for water to manage their resources. To assess tribal water resources comprehensively in western Washington, the Tribes have joined USGS in a partnership that will help improve tribal water-resources data collection, management, and analysis.

The objective of this project was to identify opportunities for improving tribal water-resources data collection, management, and analysis, including development of information systems that support water-resources management decisions. The project reviewed the current status of tribal water-resources information, including information users and needs, hydrologic data-collection efforts, and data management systems. Significant information gaps, such as streamflow in headwater streams or the water requirements of aquatic ecosystems, were identified. The project also represented a significant effort by the Washington Water Science Center to fulfill the Department of the Interior's trust responsibilities to Native American Tribes.

The proposed project also initiated implementation of the plan to integrate available information on water resources in western Washington, develop systems for accessing the information, and identify areas where additional research and monitoring is needed for a comprehensive understanding of water resources in the region.

USGS designated a hydrologist to serve as a liaison to NWIFC to coordinate assessment activities and serve as the primary USGS contact for NWIFC and tribes. The assessment had three initial tasks in 2006. The first was to identify tribal information resources and needs. The second was to review options for tribal water-resources information systems. The third and final task was to develop approaches for assessing the water requirements of aquatic ecosystems. USGS/ Tribal assessment activities in 2006 included the following:

- Identifying Tribal information resources and needs
- Reviewing options for tribal water-resources information systems, and
- Developing approaches for assessing the water requirements of aquatic ecosystems.

Recently completed assessment of Tribal water-resources information identified significant information gaps and training needs. In response to these needs, the partnership included development of a workshop on streamflow data collection. Other technical workshops are being planned for the future.

To summarize, USGS/ Tribal water-resources projects cover a broad range of water science activities as are indicated below.

In the area of data collection:

- Streamflow data
- GW-level data
- QW data
- Stream-sediment transport data
- Climate data

Data-Base capabilities include

- Streamflow, reservoir, & lake data
- GW data
- Continuous or discrete QW data
- Water-use data
- Geographic Information System (GIS) data

Investigations are underway or in planning on many topics:

- Water quantity and quality assessments
- Toxic substances in natural waters and biota
- Rural and urban nonpoint pollution
- Seawater intrusion
- SW/GW interactions
- Sediment transport and chemistry
- Effects of climate change
- Wetland functions
- Aquifer and streamflow characteristics
- Floods/droughts magnitudes and frequency
- Analytical techniques
- Watershed, SW and GW modeling
- Flood/low-flow frequency analysis
- Sediment & chemical load determination
- Aquifer testing
- Aquatic ecosystem health indexing
- GIS
- Acoustic Doppler velocity measurements
- GW age dating
- Surface and borehole geophysics
- Evapotranspiration analysis
- GW recharge and GW-flow modeling
- Solute-transport modeling
- Geochemical modeling
- Water, sediment, tissue analysis

LIST OF ACRONYMS

A

ACAT-- Alaska Community Action on Toxics
ANTHC -- Alaska Native Tribal Health Consortium
APHIS -- Animal and Plant Health Inspection Service
APIA -- Aleutian Pribilof Islands Association, Inc
ARL -- Air Resources Library
ATFE -- Akwesasne Task Force Environment

B

BIA -- Bureau of Indian Affairs
BLM -- Bureau of Land Management
BMI -- Bio Mass Index
BMPs -- Best Management Practices

C

CAA -- Clean Air Act
CAFOs -- Concentrated Feeding Operations
CAPI -- Computer Assisted Personal Interview
CBRNE -- chemical/biological/radiological/nuclear and explosives
CDC -- Centers for Disease Control
CERCLA -- Comprehensive Environmental Response, Compensation and Liability Act
CERT -- Community Emergency Response Team
COOP -- Continuity of Operations
CRA -- Comparative Risk Assessment
CRITFC -- Columbia River InterTribal Fish Commission
CUNA -- Native Cultures Institute
CWA -- Tribal Clean Water Act

D

DALY -- Disability Adjusted Life Year
DDT -- dichloro-diphenyl-trichloro-ethane
DEP -- Department of Environmental Protection
DHS -- Department of Homeland Security
DQOs -- Data Quality Objectives

E

ECMWF -- European Center for Medium Range Weather Forecasting
ECs -- Emerging Contaminants
EDAS -- Ecological Data Application System
EMAP -- Emergency Management Accreditation Program
EOP -- All-Hazard Emergency Operations Plans
EPA -- Environmental Protection Agency
EPT -- Ephemeroptera, Plecoptera and Trichoptera

EROS -- Earth Resources Observation Systems
ESFs -- Emergency Support Functions

F

FARR -- Federal Air Rules for Reservations
FDA -- Food and Drug Administration
FEMA -- Federal Emergency Management Agency
FIFRA -- Federal Insecticide, Fungicide and Rodenticide Act
FLIR -- Forward Looking Infrared technology

G

GEODE -- GEO-Data Explorer
GEOSS -- Global Earth Observing System of Systems
GFS -- Global Forecast System
GIS -- geographic information system
GLIFWC -- Great Lakes Indian Fish and Wildlife Commission
GLNPO -- Great Lakes National Program Office
GOP -- Continuity of government
GPRA -- Government Performance and Results Act
GRIB -- Gridded Binary data files
GUI -- Graphical User Interface
GW -- groundwater

H

HBCU's -- Historically Black Colleges and Universities
HCB -- hexachlorobenzene
HCCH -- hexachlorocyclohexane
HEPP -- Haudenosaunee Environmental Protection Process
HGM -- hydrogeomorphic
HSPD-5 -- Homeland Security Presidential Directive 5
HUD -- Housing and Urban Development
HYSPLIT -- Hybrid Single-Particle Lagrangian Integrated Trajectory

I

IAQ -- Indoor Air Quality
IBI -- Index of Biological Integrity
ICS -- Incident Command System
IGAP -- EPA Indian General Assistance Program
IGAP-- Indian General Assistance Program
IHS -- Indian Health Service
IKCE-SI -- Indigenous Knowledge Center for Education and Science Impacts
INRP -- Initial National Response Plan
IPM -- Integrated Pest Management
IRIS -- Integrated Risk Information System
ITEP -- Institute for Tribal Environmental Professionals

L

LANDFIRE -- Landscape Fire and Resource Management Planning Tools Project
LPS -- lipopolysaccharides

M

MALs -- maximum allowable levels
MCT -- The Minnesota Chippewa Tribe
MOU -- memorandum of understanding

N

NAM -- North American Meso
NASA -- National Aeronautics and Space Administration's
NAWQA -- National Water Quality Assessment
NBII -- National Biological Information Infrastructure
NCAR -- [National Center for Atmospheric Research](#)
NCEP -- [National Centers for Environmental Prediction](#)
NDVI -- Normalized Difference Vegetation Index
NHANES -- National Health and Nutrition Examination Survey
NHEERL -- The National Health and Environmental Effects Research Laboratory
NIEHS -- National Institute of Environmental Health Sciences
NIMS -- National Incident Management System
NLCD -- National Land Cover Data
NOAA -- National Oceanic and Atmospheric Administration
NPDES -- National Pollutant Discharge Elimination System
NRDAR -- Natural Resources Damage Assessment and Restoration
NRP -- The National Response Plan
NSDI -- National Spatial Data Infrastructure
NSF -- National Science Foundation
NSSEs -- National Special Security Events
NTCS -- National Transportation Consortium of States
NTN -- Neighborhood Transportation Network
NWASC -- Northwest Association of Schools and Colleges
NWIC -- Northwest Indian College
NWIFC -- Northwest Indian Fisheries Commission
NWIS -- National Water Information System
NWS -- National Weather Service

O

ODEQ -- Oklahoma Department of Environmental Quality
OEM -- Office of Emergency Management
OPA -- Oil Pollution Act
OPPTS -- Office of Prevention, Pesticides and Toxic Substances
ORD -- Office of Research and Development

P

PAHs -- polycyclic aromatic hydrocarbons

PART -- Program Assessment Rating Tool
PBFRs -- polybrominated flame retardants
PCBs -- polychlorinated biphenyls
PDBEs -- polybrominated diphenyl ethers
PFC -- properly functioning condition
PFOS -- perflourinated octane sulfonates
PHS -- Public Health Service
POCs -- persistent organochlorinated compounds
POPs -- persistent organic pollutants
PRP's -- potentially responsible party
PWF -- Preserved Wood Foundation

Q

QA -- Quality Assurance
QAPP -- Quality Assurance Project Plan
QC -- Quality Control
QIN -- [Quinault Indian Nation](#)

R

RARE -- Regional Applied Research Effort
RFA -- Request for Application
RI/FS -- Remedial Investigation/Feasibility Study
RIVPACS -- River Invertebrate Prediction and Classification System

S

SDWA -- Safe Drinking Water Act
SGU -- Sinte Gleska University
SKC -- Salish Kootenai College
SRT -- Self-Regulating Tidegate
STAR -- Science To Achieve Results
SW -- surface water

T

TAMS -- Tribal Air Management Support Center
TCU's -- Tribal Colleges and Universities
TEQs -- toxic equivalents
THSR -- Tribal Hazardous Sites Registry
TISC -- Tribal Invasive Species Committee
TOPS -- Terrestrial Observation and Prediction System
TSC -- Tribal Science Council

U

UN -- United Nations
UNESCO -- United Nations Educational, Scientific and Cultural Organization
USAF -- United States Air Force
USBR -- United State Bureau of Reclamation

USDA -- United States Department of Agriculture
USFS -- United States Forest Service
USGS -- United States Geological Service
UST -- underground storage tanks

V

VOC -- volatile organic compounds

W

WhAEM -- Wellhead Analytic Element Model
WHO -- World Health Organization
WMD -- weapons of mass destruction
WQS -- water quality standards

Y

YLD -- years lived with disability
YLL -- years of life lost

APPENDIX A

Forum Agenda

National Tribal Forum on Environmental Science Agenda

Quinault Beach Resort and Casino
78 State Route 115
Ocean Shores, WA 98569
Sponsored by the National

EPA–Tribal Science Council
(TSC) and hosted by the
Quinault Indian Nation (QIN)
September 24-29, 2006



Day 1 – Sunday, September 24, 2006

Location: Grand Ballroom

4:00 p.m. – 6:00 p.m. Conference Registration

Shuttle Bus Transportation will be offered free of charge from the Seattle-Tacoma International Airport to the Quinault Beach Resort and Casino. The transit departure times are: 10:00 a.m. (1:00 p.m. arrival), 1:00 p.m. (4:00 p.m. arrival) and 3:00 p.m. (6:00 p.m. arrival).

7:00 p.m. – 10:00 p.m. Quinault Indian Nation Welcome

Day 2 – Monday, September 25, 2006

Location: Grand Ballroom

7:00 a.m. – 8:00 a.m.	Conference Registration/Continental Breakfast
8:00 a.m. – 9:15 a.m.	Formal Welcoming Session
9:15 – 10:15 a.m.	Keynote Speaker Oren Lyons
10:15 – 10:30 a.m.	Morning Break
10:30 – 12:00 noon	AK Global Climate Change Lydia Olympic American Indian Alaska Native Climate Warming Working Group: A Red Paper Daniel R. Wildcat, Margaret Hiza-Redsteer, Don Aragon, and Roberto Gonzalez-Plaza
12:00 – 1:00 p.m.	Lunch (Sponsored by the Quinault Beach Resort)
1:00 p.m. – 6:00 p.m.	Field Trip #1: Beach Field Trip #2: Rain Forest Take Shuttle Outside Lobby
6:00 p.m. – 8:00 p.m.	Reception and Poster Session/Tribal Success Stories

Day 3 – Tuesday, September 26, 2006Location: Ballrooms 1–4

7:00 a.m. – 8:00 a.m.

Conference Registration/Continental Breakfast

Tuesday 8:00 a.m. – 9:45 a.m.		Breakout Sessions and Training	
Ballroom #1 Air Pollution Transport Facilitators: Christine Berini and David LaRoche Identifying Transport Pathways Using the HYSPLIT Model Glenn Gehring Petroleum Coke Dust Emissions From Open Boxcars Along the Shoreline of North Puget Sound, Washington Tony Basabe	Ballroom #2 Water Facilitators: Robert Hillger and Daniel Kusnierz Monitoring the Water Quality at Boyden, Lake After Repairing the Fish Ladder Steve Crawford Potential Effects of Suburbanization on the Water Quality and Quantity of Boiling Springs, a Sacred Area, to the Shakopee Mdewakanton Dakota Community, Scott County, Minnesota Lanya Ross	Ballroom #3 Training: Risk Assessment and EPA/Tribal Cases Facilitators: Tony David and Rita Schoeny Risk Assessment Overview Rita Schoeny	Ballroom #4 Training: Data Management for Water Monitoring (All Day) Facilitators: Elizabeth Wendt Tribal Clean Water Act (CWA) 106 Guidance Overview Carol Russell, EPA R8 Data Storage Eric Wilson, EPA R9

9:45 a.m. – 10:00 a.m. Morning Break

Tuesday 10:00 a.m. – 11:45 a.m.		Breakout Sessions and Training	
Ballroom #1 Indoor Air Facilitators: Christine Berini and David LaRoche Tribal Science in Action Case Studies from Bois Forte	Ballroom #2 Water Facilitators: Robert Hillger and Daniel Kusnierz Developing Reference Water Quality Conditions	Ballroom #3 Training: Risk Assessment and EPA/Tribal Cases Facilitators: Tony David and Rita Schoeny A Risk Analysis for	Ballroom #4 Training: Data Management for Water Monitoring (All Day) Facilitators: Elizabeth Wendt Data Storage

Environmental Services IAQ Program Kevin Koski Mold: Mycotoxins, Indoor Air Health Crisis in Indian Country Curtis Munoz	for the Pueblo de Taos, New Mexico Robert Gomez and Jeff Ogburn The Development of Water Quality Standards on the Pyramid Lake Paiute Indian Reservation Daniel Mosley	Contaminated Sportfish Tony David Using GIS to measure vulnerability and risk associated with UST's Frank Harjo	(continues) Tribal Perspective: Region VIII Tribal Water Quality Data Management Model Christa Tyrell, Fort Peck Assiniboine and Sioux Tribes; and Dave Wilcox, Gold Systems
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11:45 a.m. – 1:00 p.m. Lunch (on your own)

Tuesday 1:00 p.m. – 2:45 p.m. Breakout Sessions and Training			
<p>Ballroom #1 Earth Facilitators: Marshall Cheung and Thomas Baugh</p> <p>Groundwater Heating in Forested Wetlands: A Pilot Study in the Hoh River Watershed Jill Silver</p> <p>An Investigation of the Possibility of Mixing of Waters in After-Action Monitoring Wells in Ottawa County, Oklahoma Tim Kent</p>	<p>Ballroom #2 Water and Community Health Facilitators: Troy Pierce and Patti Tyler</p> <p>Source Water Protection Planning in a Shallow Alluvial Aquifer Dale Becker and Samuel Iwenofu</p> <p>Potential Contribution of the Burden of Disease and Injury To Assess Community Health in Indian Country Catherine Michaud</p>	<p>Ballroom #3 Training: Risk Assessment and EPA/Lifeline Facilitators: Elizabeth Resek</p> <p>OPPTS Tribal Lifeline Project: Exposure and Risk Assessment Software for Tribal Communities and Other Unique Subpopulations Anne Marie Chaisson and Christine F. Chaisson, The LifeLine Group</p>	<p>Ballroom #4 Training: Data Management for Water Monitoring (Continues) Facilitator: Elizabeth Wendt</p> <p>Data Assessment/Analysis/Exercise Gretchen Watkins, Lac Du Flambeau Band of Lake Superior Chippewa Indians with Carol Russell, EPA R8 and Jennifer Ousley, EPA R7</p>

2:45 p.m. – 3:00 p.m. Afternoon Break

Tuesday 3:00 p.m. – 4:45 p.m.		Breakout Sessions and Training	
<p>Ballroom #1</p> <p>Earth</p> <p>Facilitators: Marshall Cheung and Thomas Baugh</p> <p>Invasive Species Impacts in Indian Country</p> <p>Robin Powell and Pyramid Lake Paiute Tribe</p> <p>Mercury Contamination of Cheyenne River Sioux Land</p> <p>Dave Nelson, Cheyenne River Sioux Tribe</p> <p>Impacts of Climate Change and Land Use in the Southwestern United States</p> <p>Margaret Hiza-Redsteer</p>	<p>Ballroom #2</p> <p>Water and Community Health</p> <p>Facilitators: Troy Pierce and Patti Tyler</p> <p>Relationship Between In-Home Water Service and Acute Respiratory Infections Among Alaska Natives</p> <p>Troy Ritter and Jeff Smith</p> <p>Improved Water Quality and Community Health in the Border Indigenous Communities of Baja California</p> <p>Hiram Sarabia and Paula Stigler</p>	<p>Ballroom #3</p> <p>Training: Risk Assessment and EPA/Lifeline</p> <p>Facilitators: Elizabeth Resek</p>	<p>Ballroom #4</p> <p>Training: Data Management for Water Monitoring</p> <p>(Continues)</p> <p>Facilitators: Elizabeth Wendt</p> <p>Data Reporting/Exercise</p> <p>Eric Wilson, EPA R9</p> <p>Closing Remarks</p> <p>Carol Russell, EPA R8</p>

4:45 – 5:45 p.m.

Northwest Indian College: An Introduction to the College and Discussion.
Refreshments will be served!

Day 4 – Wednesday, September 27, 2006

Location: Ballrooms 1–4

7:00 a.m. – 8:00 a.m.

Conference Registration/Continental Breakfast

Wednesday 8:00 a.m. – 9:45 a.m.		Breakout Sessions and Training	
Ballroom #1 Air Facilitators: David LaRoche and Michele Dineyazhe Where Does the Dust Come From? An Analysis of Days with the Highest Particulate Concentrations on the Bishop Paiute Reservation, 2003-2006 Toni Richards Eastern Shawnee Tribe of Oklahoma's Method of Focusing Permit Review April Crouch	Ballroom #2 Water Facilitators: Troy Pierce and Marshall Cheung The Utility of Indices of Biological Integrity for Depressional Wetlands in Central Oklahoma Dena Hartzell, Joseph R. Bidwell, and Craig A. Davis From Greens to Blue-Greens: An Investigation of Algal Blooms in the Penobscot River Daniel Kusnierz, Penobscot Indian Nation	Ballroom #3 Overview of Science Grants and Tips for Successful Tribal Proposals (Includes PART) Facilitators: Elizabeth Resek and Christine Berini Introduction to GPRA/Measures/PART Elizabeth Resek, U.S. EPA Grant Writing Overview: What to Look For in an RFA; How to Partner With Academics and Other Institutions Kathy Hill, J.D., LL.M.; and Joseph Dupris, Ph.D., J.D., Quail Plume Enterprises	Ballroom #4 Training: Overview of Water Quality Standards From a Tribal Perspective (All Day) Facilitator: Nancy Schuldt Treatment as a State Nancy Schuldt, Fond du Lac Band of Lake Superior Chippewa; Dan Mosely, Pyramid Lake Paiute; and Tracey Ledder, Bad River Band of Lake Superior Chippewa Use Classification System and Beneficial Uses Nancy Schuldt, Fond du Lac Band of Lake Superior Chippewa; Margaret Watkins, Grand Portage Band of Lake Superior Chippewa; and Robert Gomez, Taos Pueblo

9:45 a.m. – 10:00 a.m. Morning Break

Wednesday 10:00 a.m. – 11:45 a.m. Breakout Sessions and Training			
<p>Ballroom #1 Panel and Dialogue Session: How can Tribal Colleges and Tribal Government Environmental Programs Work Together for the Benefit of their Communities? Facilitator: Dan Burns</p> <p>Panel Presentations: Charlotte Clausing, Northwest Indian College; TBA, Lummi Nation; Dawn Thomas and Bill Swaney, Salish Kootenai College; Richard Janssen, Salish Kootenai Tribe; and Gary Halverson, Sitting Bull College</p>	<p>Ballroom #2 Water Facilitators: Michael Bolt and Dana Davoli</p> <p>Activities of the Grand Portage Reservation (Minnesota) To Protect and Restore the Aquatic Habitat and Reduce Biological Stressors in Lake Superior Bradley Frazier</p> <p>Development of a Physical/Bioassessment Program on the Pyramid Lake Paiute Indian Reservation, Nevada Daniel Mosley</p>	<p>Ballroom #3 Overview of Science Grants and Tips for Successful Tribal Proposals (Includes PART) Facilitators: Elizabeth Resek and Christine Berini</p> <p>Grant Writing Overview: What to look for in an RFA; How to Partner with Academics and other Institutions (Continues)</p> <p>Regional Overview: Grant Workplans and Accountability Elizabeth Wendt, U.S. EPA R7</p> <p>Navajo Nation National Science Foundation Grant Dr. Willard Gilbert, Northern Arizona University</p>	<p>Ballroom #4 Training: Overview of Water Quality Standards From a Tribal Perspective (All Day) Facilitator: Nancy Schuldt</p> <p>Antidegradation Nancy Schuldt, Fond du Lac Band of Lake Superior Chippewa and Char Naylor, Puyallup Tribe</p> <p>Outstanding Reservation Resource Waters Nancy Schuldt, Fond du Lac Band of Lake Superior Chippewa and Gretchen Watkins, Lac du Flambeau Band of Lake Superior Chippewa</p>

11:45 a.m. – 1:00 p.m. Lunch (Sponsored by Best Western)

Wednesday 1:00 p.m. – 2:45 p.m.		Breakout Sessions and Training	
<p>Ballroom #1</p> <p>Earth</p> <p>Facilitators: Marshall Cheung and David Macarus</p> <p>U.S. Geological Survey (USGS) Projects Supporting Environmental Science on Tribal Lands David Meyer</p> <p>EPA Indian General Assistance Program (IGAP) Success Stories: Nikolski Drum Cleanup and Pauloff Harbor Quality Assurance Project Plans (QAPP), Battery Cleanup, and Sampling, Aleutian Islands, Alaska Chris Riggio</p>	<p>Ballroom #2</p> <p>Culture and Community Health</p> <p>Facilitators: Michael Callahan and Richard Janssen</p> <p>Quinalt Indian Nation Development of Tribal Seafood Consumption Survey Software Anna Towksjhea, Samuel Iwenofu, and Lon Kissinger</p> <p>Cultural Science and the Twenty-Nine Palms Tribe: A Native Paradigm Clifford Trafzer, Willard Gilbert, and Anthony Madrigal</p>	<p>Ballroom #3</p> <p>Overview: Quality Assurance Tools – Quality Assurance Project Plan (QAPP) Development Tool</p> <p>Facilitators: Elizabeth Jackson</p> <p>Quality Assurance Project Plan (QAPP) Development Tool David Taylor, U.S. EPA R9</p>	<p>Ballroom #4</p> <p>Training: Overview of Water Quality Standards From a Tribal Perspective (Continues)</p> <p>Facilitators: Nancy Schuldt</p> <p>Criteria Development Nancy Schuldt, Fond du Lac Band of Lake Superior Chippewa; Dan Mosely, Pyramid Lake Paiute; and Margaret Watkins, Grand Portage Band of Lake Superior Chippewa</p> <p>Implementation Nancy Schuldt, Fond du Lac Band of Lake Superior Chippewa; Rick Gitar, Fond du Lac Band; and Paula Webster, Confederated Salish and Kootenai</p>

1:00 p.m. – 5:30 p.m.	Tribal Science To Achieve Results (STAR) Grantees Progress Review Grand Suite
2:45 p.m. – 3:00 p.m.	Afternoon Break

Wednesday 3:00 p.m. – 4:45 p.m.		Breakout Sessions and Training	
<p>Ballroom #1</p> <p>Earth</p> <p>Facilitators: Rollie Hemmett and Dave Nelson</p> <p>Training: Tribal Emergency Management</p> <p>Overview of National Incident and Management System (NIMS)</p> <p>AnJanette Fisher and Stacy Eich</p>	<p>Ballroom #2</p> <p>Tribal Diet and Community Health</p> <p>Facilitators: Michael Callahan and Richard Janssen</p> <p>Tribal Food Safety Initiative</p> <p>John Persell</p> <p>A Tribal Monitoring Program To Assess the Human Tissue Accumulation and Health Effects of Persistent Organic Compounds and Heavy Metals Consumed in the Traditional Diet in Rural Alaska Native Mothers and Infants</p> <p>James E. Berner and Martina Lauterbach, R.N.</p>	<p>Ballroom #3</p> <p>Overview: Quality Assurance Tools – Turbo QAPP</p> <p>Facilitators: Elizabeth Jackson</p> <p>Turbo QAPP</p> <p>Melinda Ronca-Battista, Institute for Tribal Environmental Professionals</p>	<p>Ballroom #4</p> <p>Training: Overview of Water Quality Standards From a Tribal Perspective (Continues)</p> <p>Facilitator: Nancy Schuldt</p> <p>Monitoring</p> <p>Nancy Schuldt, Fond du Lac Band of Lake Superior Chippewa</p> <p>Assessment: Attainment or Impairment</p> <p>Nancy Schuldt, Fond du Lac Band of Lake Superior Chippewa; and Jeff Ogburn, Taos Pueblo</p> <p>Questions and Discussion</p>

4:45 – 6:30 p.m.

Free Time

6:30 p.m. – 9:00 p.m.

Movie Night

Homeland: Four Portraits of Native Action

Alaska Native Diet: Monitoring For Contaminants In Rural Alaska

Day 5 – Thursday, September 28, 2006
Location: Ballrooms 1–4 & Grand Ballroom

7:00 a.m. – 8:00 a.m. Conference Registration/Continental Breakfast

Thursday 8:00 a.m. – 9:45 a.m.		Breakout Sessions and Training	
Ballroom #1 Air Deposition Facilitators: Christine Berini and David LaRoche Fond Du Lac Reservation Comprehensive Mercury Monitoring Program Nancy Schuldt and Nick Axtell Fond Du Lac Band of Lake Superior Chippewa Alaska Native Science Larry Merculieff	Ballroom #2 Water and Community Health Facilitators: Curtis Munoz and Dana Davoli Emerging Issues, Contaminants in Our Environment, Endocrine Disruptors, Pharmaceuticals, and Personal Care Products Dr. Kim Winton Assessing Overall Concerns from Hazardous Waste Sites on Tribal Lands Dr. Lynn Zender	Ballroom #3 Training: Methamphetamine Lab Hazard Assessment Overview Facilitator: Marshall Cheung and Michele Dineyazhe Cherokee Nation Methamphetamine Brad Asbill	Ballroom #4 Training: Introduction to Natural Resources Damage Assessment and Restoration (NRDAR) Facilitator: David Charters An Introduction to Natural Resource Damage Assessment and Restoration Dolores Savignano, U.S. Fish and Wildlife Service Trusteeship and Tribal Opportunities Al Sedik, Bureau of Indian Affairs

9:45 a.m. – 10:00 a.m. Morning Break

Thursday 10:00 am. – 11:45 a.m. Breakout Sessions and Training			
<p>Ballroom #1</p> <p>Earth</p> <p>Facilitators: Michael Bolt and Patti Tyler</p> <p>Training: Emergency Management</p> <p>Federal Response and Recovery for Tribes</p> <p>Andrew Hendrickson, FEMA and Jason Jackson, Quinault Tribe</p>	<p>Ballroom #2</p> <p>Tribal Diet and Community Health</p> <p>Facilitators: Curtis Munoz and Dana Davoli</p> <p>Results From the Swinomish Tribal Human Health Risk Assessment of Contaminated Seafood</p> <p>Jamie Donatuto and Barbara Harper</p> <p>Polychlorinated Biphenyls in Serum of the Siberian Yupik People From St. Lawrence Island</p> <p>Vi Waghiyi and Pamela K. Miller</p>	<p>Ballroom #3</p> <p>Training: Methamphetamine Lab Hazard Assessment Overview</p> <p>Facilitator: Marshall Cheung and Michele Dineyazhe</p> <p>Cherokee Nation Methamphetamine</p> <p>Robert Keck</p>	<p>Ballroom #4</p> <p>Training: Natural Resources Damage Assessments</p> <p>(Continued)</p> <p>Facilitator: David Charters</p> <p>Differences Between CERCLA Remediation and NRDAR Restoration</p> <p>Mark Huston, U.S. Fish and Wildlife Service</p> <p>Restoration</p> <p>Dolores Savignano, U.S. Fish and Wildlife Service</p> <p>Coordination of Trustees and Response Agencies: Case Studies</p> <p>Robyn Blackburn, U.S. Fish and Wildlife Service</p>

11:45 a.m. – 1:15 p.m. Lunch (on your own)

1:15 p.m. – 3:00 p.m. Plenary Session
Grand Ballroom
Facilitator: Claudia Walters

Cultural Sustainability Models: Using Our “Ways of Knowing” in Management and Group Discussion

Terry Williams, Preston Hardison, Mary Arquette,
James Ransom, and Claudia Walters

3:00 p.m. – 3:15 p.m. Afternoon Break

3:15 p.m. – 4:00 p.m.	Plenary Session Grand Ballroom TSC Session: Summary of Conference, Future Tribal Science Priorities and Goals, and Closing Comments Roland Hemmett and David Nelson
4:00 p.m. – 5:00 p.m.	Free Time
5:00 p.m. – 6:00 p.m.	Reception sponsored by Twenty-Nine Palms Band of Mission Indians
6:00 p.m. – 7:30 p.m.	Closing Ceremony Emcees: Roland Hemmett and David Nelson Keynote Speakers: Dr. Cindi Barton, Director of the U.S. Geological Survey's Water resources Science Center and Quinault Tribal Elder Closing Ceremony: Quinault Indian Nation

Friday, September 29, 2006
 Travel Day

Transportation will be offered free of charge from the Quinault Beach Resort and Casino to the Seattle-Tacoma International Airport on a full-sized bus operated by Gray's Harbor Transit. The transit departure times are at 8:00 a.m. (11:00 a.m. arrival), 10:00 a.m. (1:00 p.m. arrival), and 1:00 p.m. (4:00 p.m. arrival).

The shuttle will be located outside of the hotel lobby.

APPENDIX B

List of Participants

Eveli Abeyta

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APPENDIX C

Speaker Biographies

Speaker Biographies

Sarah Akin is a Water Quality Technician II in the Swinomish Office of Planning and Development. She is a graduate of Western Washington University (B.S. in Environmental Science). Her research at Swinomish has focused on stream bio-indicators as well as monitoring, data management, and analysis of the Tribe's water resources.

Mary Frances Arquette (Iotenerahtatenion) is Wolf Clan from the Mohawk Nation at Akwesasne. She works for the Akwesasne Task Force on the Environment, in partnership with the Akwesasne Freedom School and HETF on an EPA-funded STAR Tribal Grants program. Dr. Arquette received her Ph.D. in Environmental Toxicology from Cornell University in 1994 and her Doctor of Veterinary Medicine from the New York State College of Veterinary Medicine in 1990. She has worked as a graduate assistant in American Indian Studies and as an assistant professor of environmental studies. Dr. Arquette has published several articles on Native American environmental issues as well as immunotoxicology. She is married to David Arquette (Bear Clan from Akwesasne) and is the mother of three small children.

Nick Axtell has been employed by the Fond du Lac Band of Lake Superior Chippewa since March 2003 as the Air Program Coordinator. He received his Bachelors of Science in Chemical Engineering from the University of Minnesota, Duluth. During his tenure as a student, he researched the biosorption ability of aquatic plants to remove aqueous metallic ions from the water and was an intern with the American Indian Environmental Office in Washington, DC. In addition to his duties at Fond du Lac, he serves on the Executive Committee as a representative for Region V in the National Tribal Air Association.

Dr. Cynthia Barton is Director of the USGS Washington Water Science Center, based in Tacoma. Dr. Barton also serves as the USGS State Representative for geology, hydrology, biology and geography. She is a descendent of the Delaware Nation, and was raised in Philadelphia. She received her doctorate in geology from the University of Wisconsin-Madison, her master's degree in geology from Bryn Mawr, and her bachelor's degree in geology from Susquehanna University. She is a licensed geologist and hydrogeologist in the State of Washington. Author of many water quality and water supply studies, Dr. Barton has developed water resources programs throughout the Great Lakes region as well as in the Pacific Northwest, both in the U.S. and Canada.

James E. Berner is the Senior Director for Science in the Division of Community Health of the Alaska Native Tribal Health Consortium and has served as a part-time clinician since 1984. He directs the Alaska Native Traditional Food Safety Monitoring Program which assesses contaminant and micronutrient levels in pregnant Alaska Native women and evaluates health effects in mothers and newborn infants. He has been the key national expert for the United States on the Human Health Advisory Group of the Arctic Monitoring and Assessment Program (AMAP), a Program of the Arctic Council, since 1999. Dr. Berner was co-lead author of the chapter on the impact of climate change in the health of Arctic residents in the Arctic Climate Impact Assessments. In April 2005, he was appointed to the National Academy of Sciences Polar Research Board. Dr. Berner graduated from Oklahoma University Medical School in 1968. He spent 3 years in the U.S. Navy Medical Corps, completed residency training, and is board certified in Internal Medicine and Pediatrics. He has practiced medicine in the Alaska Native health care system since 1974.

Anne Marie Chaisson is a Nutritionist for The LifeLine Group where she is working on the Dietary Record Generator that will be used in the Tribal LifeLine™ Model. Ms. Chaisson has an undergraduate degree in Kinesiology and Psychology from the College of William and Mary and a Master of Public Health in human nutrition from the University of North Carolina at Chapel Hill, School of Public Health.

Following a clinical internship, Ms. Chaisson obtained her registration as a clinical dietician (R.D.). Ms. Chaisson has experience working with mothers and children served by the Women, Infants, and Children Program (WIC) in both North Carolina and Virginia. She has worked as a laboratory assistant and worked on a nutrition and pregnancy study administering multiple 24-hour recalls. Prior to joining The Lifeline Group, Ms. Chaisson worked as a clinical dietician at the University of Virginia Medical Center where her practice included nutrition needs before and after solid organ transplant surgery, nutrition needs in adults living with cystic fibrosis, high-risk pregnancy nutrition counseling, and nutrition counseling for families and children affected by genetic disorders and/or congenital defects.

Christine F. Chaisson is a recognized expert in risk assessment and regulatory strategies for pesticides, food additives, and other chemicals in the human environment. She is one of the architects of the first exposure assessment software models, the most recent being used in the United States. Dr. Chaisson began her career in risk assessment when she was recruited to the U.S. Environmental Protection Agency in the Office of Pesticides and Toxic Substances. Before becoming the Acting Chief of Toxicology, she served as the Chief Project Officer for research, overseeing projects at several EPA research facilities as well as the lead toxicologist for risk assessments on many pesticides.

In 1985, Dr. Chaisson co-founded Technical Assessment Systems (TAS), which became the premier exposure/risk assessment consulting firm internationally. Through TAS, she introduced concepts such as population subgroup specificity, better definition of residues in forms of foods and sources of drinking water, use of human activity patterns, and actual chemical usage patterns for more accuracy and relevance in risk assessment models. Her regulatory strategies have been important advances for both industry and government. Dr. Chaisson's skills in communication and visualization of the risk assessment process and its consequences to society have attracted many speaking opportunities and positions on policy boards. Dr. Chaisson also serves on the National Council for Arts and Sciences of the George Washington University (GWU) and the Dean's Advisory Board for the GWU Graduate School of Political Management.

Charlotte Clausing is a graduate of Western Washington University with a B.S. degree in Biology/Botany (2000). She received an A.A.S. degree from Northwest Indian College in 1996. From 2003 to 2006 she worked at the Northwest Indian College as a Water Quality Field and Lab Technician II and prior to her employment there she worked on freshwater and marine re-circulation aquaculture systems and as a Salmon Hatchery Technician for the Lummi Tribal Fisheries. Ms Clausing has also taught, as a student a Teaching Assistant in 1999 and as laboratory instructor for TENRM student science classes during fall and winter quarters of 1998-1999. She was and ecology subcontractor on N. Rapin's 1998, Master Thesis on Macroinvertebrate Assemblages and Habitat Variables in Hutchinson Creek for Lummi Natural Resources Department and also worked as a Field Ecologist on the Anderson Creek project for the Nooksack Tribe Department of Water Resources in 1997 and a NASA/AMES Hydroponics research/assistant from 1995 to 1996. Her Tribal affiliation is the White Earth Reservation in Minnesota.

Steve Crawford has been the Environmental Director of the Passamaquoddy Tribe at Pleasant Point, Perry, Maine since February 2003. He received an M.Sc in Zoology from the University of Oklahoma in 1976, and an M.Sc. in Psychology from Walden University in February 2006. Mr. Crawford has spent more than 25 years in the aquaculture industry, designing and operating the largest catfish farm and processing plant in Oklahoma and becoming the first to design and operate a nori (seaweed) commercial farm in the Western North Atlantic in Cobscook Bay, Maine. One of his proudest achievements was bringing suit against the three largest salmon farms in Maine for violation of the Clean Water Act NPDES and winning which resulted in major permitting changes and piscicultural techniques that greatly reduce environmental impacts of salmon farms. He has won numerous environmental awards and serves on several National Tribal Environmental committees.

April Crouch received her B.S. in Environmental Health with a minor in Biology from Missouri Southern State University in 2004 and graduated Summa Cum Laude with a 4.0 GPA. She is a certified environmental health specialist in the State of Missouri and is also HAZWOPER certified. She was previously employed by Hampshire Pet Products in Joplin, Missouri where she worked as a quality assurance technician. She is currently the Air Quality Officer for the Eastern Shawnee Tribe of Oklahoma in Seneca, Missouri. She uses Geographic Information Systems to perform modeling of the tribal air shed for the purpose of focusing Title V permit reviews, and conducts education and outreach activities to educate the public.

Tony David is Program Manager of Water Resources with the St. Regis Mohawk Tribe, Environment Division on the US / Canada border (northern New York State). He has a Master of Professional Studies in Environmental Management from Cornell University and a B.A. in Environmental Studies from SUNY Buffalo. He completed coursework in risk analysis and focused specifically on developing a comprehensive risk framework as a scoping tool to capture and describe risks and costs faced by indigenous peoples. He recently presented at the National River Rally (River Network) in NH and at the National Forum on Fish Contaminants (USEPA) in MD.

Adam DeWeese has been an environmental biologist with the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) since 2004. He currently works through an EPA Science To Achieve Results (STAR) grant which focuses on producing GIS-based fish consumption advisory maps that protect tribal members from the health risks of consuming walleye contaminated with methylmercury. These culturally sensitive advisory maps are created using data from an extensive walleye tissue sampling program in the treaty ceded territories of Northern Michigan, Minnesota, and Wisconsin. They provide specific meal frequency recommendations for harvested lakes and were produced with input from tribal member focus groups.

Mr. DeWeese has given numerous presentations to tribal fish harvesters, elders, health care providers, and youth about mercury and GLIFWC's walleye consumption advisory program. He holds a B.S. in Biology from East Tennessee State University, an M.S. in Ecology and Evolutionary Biology from the University of Tennessee, and is currently working on a Ph.D. in Water Resources Science through the University of Minnesota.

Jamie Donatuto has been working for the Swinomish Indian Tribal Community as an Environmental Specialist since 2000. She writes, enacts, and manages several environmental health-based investigations, including the EPA-funded Bioaccumulative Toxics In Native American Shellfish Project which hypothesizes that Swinomish people are exposed to low-level chronic bioaccumulative toxics when gathering and consuming local shellfish. She launched the Swinomish Environmental Education Program and works extensively with community education and outreach projects. She is a Ph.D. candidate at the University of British Columbia in Vancouver, Canada. Her dissertation research is titled "There is No Word for 'Risk' in the Lushootseed Language—Redefining Human Health Risk Assessments for Native Americans by Incorporating Socio-Cultural Factors: A Case Study."

Joseph C. Dupris is currently a partner in Quail Plume Enterprises. His work includes consulting with tribes with regard to planning and management for environmental compliance, drafting various ordinances and processes, and other efforts. He has almost 40 years of experience as an educator. Most recently, Dr. Dupris was an Associate Professor (tenured) at Humboldt State University and was the former Department Chair of Native American Studies. He has provided free civil (non-criminal) legal services to people who cannot afford a lawyer with respect to health care, education, trust property, public, and other related benefits.

Stacy Eich is the Senior Tribal Emergency Preparedness Coordinator for DSD Laboratories. She assists Native American Tribes in developing emergency management and homeland security programs. She provides homeland security and emergency management planning services to Tribal governments, assisting in the effective design, implementation, and maintenance of a comprehensive Tribal homeland security and emergency management program consistent with applicable Federal rules and regulations, specific to Department of Homeland Security (DHS) compliance measures. She excels in Federal and/or State grant preparation, specifically grants that support specific Tribal homeland security and emergency management needs and requirements. She aids in the facilitation of meetings between the Tribal officials and the Federal and/or State government. She also facilitates planning meetings with Tribal officials regarding internal matters of emergency management and homeland security. She is heavily involved in the planning aspects of the various programs and is writing Tribal Emergency Operations Plans, Pandemic Influenza Plans, Pre-Disaster Mitigation Plans, and All Hazards Mitigation Plans. She also provides all of the exercise support for these Tribal programs.

Ms. Eich received her Bachelor's Degree in Political Science from the University of Wyoming, and pursued a Masters Degree in International Terrorism working with Professor Stephen Sloan, an expert, not only in international terrorism but also on the OKC bombing. She learned and gained valuable insight into terrorism that led to a position with the National Homeland Security Training Center at Camp Gruber, Oklahoma, which she provided initial homeland security analytical support to the National Homeland Security Training Center.

A.J. Fisher is the Director of Tribal Homeland Security and Emergency Management Programs. Ms. Fisher has more than 10 years of experience working within all facets of the government. Her career began with working, in collaboration, with the Department of Defense (DoD), North Atlantic Treaty Organization (NATO), and Coalition Forces on the development of an conceptual intelligent, policy—enabling technology that provided a solution to global interoperability, information sharing, situational awareness, and multi-level security issues. She is responsible for compiling and cross-referencing applicable Federal, Tribal, state, and local statutes, directives, policies, and guidelines that outline the requirements and actions necessary to achieve and maintain full Homeland Security-policy compliance.

Ms. Fisher has taken a strong interest in working with Tribal nations. Her clear understanding of the challenges that Tribal nations are facing pertaining to the implementation of their homeland security and emergency management programs has allowed her to develop a unique Tribal homeland security strategy that links state and Federal homeland security grant programs for which Tribal Nations are eligible, either directly or indirectly, for implementing all applicable homeland security program elements. The Tribal homeland security strategy quantifies Tribal needs, mitigates deficiencies, and reinforces capabilities to prevent and respond to acts of terrorism and natural disasters.

Harmony Fleming is a Graduate Research Assistant in the Department of Public Health at Oregon State University, and is pursuing an M.S. degree in Environmental Health and Occupational Safety Management. She has a B.A. degree from Western Washington University in Human Geography and Environmental Studies, with additional coursework in GIS, community planning, statistics, and natural resource management. She has experience working as an environmental health technician in the West Nile Virus program, in the Whatcom County Health Department, where she was responsible for conducting public outreach to affected populations as well as being engaged in field work. She serves on the Benton County Food Safety Commission Board. Her current research focuses on groundwater arsenic concentrations and cancer incidence in regional areas in Oregon.

Bradley E. Frazier has an M.S. degree in Biology, Aquatic Toxicology and Contaminants (1994) and a B.S. degree in Biology, Aquatic Science, with a minor in Chemistry (1991) from the University of

Wisconsin, La Crosse, Wisconsin. He is the Environmental Department Director for the Grand Portage Band of Lake Superior Chippewa, Grand Portage, Minnesota. Mr. Frazier manages the Environmental Department activities and serves as the primary Tribal staff contact on all environmental matters between Grand Portage and U.S. EPA and other agencies. Previously he worked as Fish and Wildlife Biologist for the U.S. Fish and Wildlife Service in Spokane, Washington where he designed, coordinated, and managed studies to investigate contaminants in aquatic ecosystems and assess the ecological impact of contaminants on fish and wildlife populations at Superfund sites. In addition, he has been an Associate Researcher at the River Studies Center, University of Wisconsin-La Crosse, La Crosse, Wisconsin (1994 to 1999) and coordinated studies concerning the biogeochemistry and the bioavailability of mercury, trace metals, and other contaminants in freshwater ecosystems. He conducted field sampling and researched the chemistry and biological implications of ammonia nitrogen in sediment pore water and surface water as a Physical Science Technician for the U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin from 1992 to 1994 and from 1989 to 1992 he was a student research assistant at the River Studies Center, University of Wisconsin-La Crosse, La Crosse, Wisconsin where he conducted trace metal analysis of fish and sediments.

Glenn Gehring is a citizen of the Cherokee Nation and is currently employed as the Manager of the Office of Air Quality at the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). Prior to his work at CTUIR, he worked at the Tribal Air Monitoring Support (TAMS) Center in Las Vegas as the Technology Specialist. He also worked as an Environmental Specialist at the Inter-Tribal Environmental Council (housed at Cherokee Nation), as an Air Quality Specialist with the Suquamish Tribe, and as both an Engineer Technician and Environmental Health Specialist with the Indian Health Service. He has two Associate degrees, one in Laboratory Science and the other in Aviation Maintenance Technology. He also holds a Bachelor of Science degree in Natural Resources from The Ohio State University

Willard Sakiestewa Gilbert (Hopi) is a Professor of Education in the College of Education at Northern Arizona University in Flagstaff, Arizona. Dr. Gilbert was the Principal Investigator of the Native Science Connections Research Project (NSCRP) funded by the National Science Foundation. This scientifically research-based instruction and curriculum model (Native Science Supplemental Curriculum) integrated Navajo, Hopi, San Carlos Apache, and Zuni tribal cultural knowledge into the existing science curriculum.

Robert Gomez is the Director of the Taos Pueblo Environmental Office (TPEO). He has more than 11 years of experience in the environmental field, the last 5 years as Director of TPEO. He attended New Mexico State University, and was hired at Taos Pueblo as a student intern under an EPA/University Community Partnership grant. He has a broad background in water quality assessment. He developed the water quality monitoring programs and quality assurance documents for Clean Water Act Section 106 grants for the Pueblo of Taos and for the Pueblo of Picuris in New Mexico.

In 2005, Mr. Gomez joined the Board of Trustees of River Network, a national non-profit river conservation organization, based in Portland Oregon. He is an active participant in the national River Rally (www.rivernetwork.org/rally), and has reviewed the “Listening to Watersheds” publication, aimed specifically at tribes developing water quality assessment programs. He is also on the steering committee of the Indigenous Waters Network, a national Native grassroots water resources advocacy group. In 2006, he organized a “Clean Water Act training for Tribal Leaders” held in Taos, New Mexico, in which 13 tribes sent leaders or environmental staff. Other trainings he has sponsored for New Mexico tribes include the River Watch Network adaptation of EPA Rapid Bioassessment Protocol II, and geomorphic characterization techniques. He is an enrolled tribal member of the Pueblo of Taos, and enjoys the unspoiled natural resources of the Taos Indian reservation, particularly the cold, clear waters of the Rio Lucero, its abundant wild trout and their willingness to chase an Elk Hair Caddis.

Roberto Gonzalez-Plaza has been a faculty member at Northwest Indian College since 1998. He was a core member of the National Science Foundation (NSF)-funded Tribal Environmental Management Program (TENRM) and is a member of the NSF-funded Tribal College and University Program (TCUP). Dr. Gonzalez-Plaza has collaborated in the development of place-based science courses and has established multiple educational and research alliances with federal agencies, tribal colleges, and other institutions. He has organized symposia at the Ecological Society of America and the annual meeting of the American Association for the Advancement of Science (AAAS), the largest science group in the United States including the upcoming symposium “The Archaeology of the Mind: From Petalio to Societies” related to Roberto’s research regarding the basis of human cognition. Mr. Gonzalez-Plaza has been a member of the inner circle of the Language of the Spirit held at Albuquerque, New Mexico. He is also a member of the American Society of Cell Biology and the Ecological Society of America.

Cyd Hanns currently works as a wildlife research assistant with the North Slope Department of Wildlife Management. She holds a B.S. degree in Biology from the University of Alaska Fairbanks and earned an A.A. degree in Fire Science from the local Ilisagvik College during her 10 years of volunteering with the Barrow Volunteer Fire Department. Prior to working for the NSB Department of Wildlife Management, she worked as assistant public health office/veterinary technician for 17 years with the North Slope Borough Public Health Office/Veterinary Program. Her current research activities include project coordination and fieldwork related to health assessment related studies of North Slope subsistence wildlife species. She feels privileged to have co-authored a number of published papers with experts in the field. She is married to Craig George, a wildlife biologist; they enjoy many different community activities with their two sons, Luke and Sam.

Anna K. Harding is an Associate Professor in the Department of Public Health with research expertise in environmental contamination and population-based risk, and a registered sanitarian. Other areas of expertise include water quality, community involvement, and risk communication. Her current projects include working with Dr. Harper on an EPA STAR grant to develop regional exposure scenarios for tribal communities engaged in subsistence lifestyles and serving as co-PI on grant to conduct a Behavioral Risk Factor Surveillance Survey with the Confederated Tribes of Warm Springs, Oregon. Ms. Harding is also investigating tribal exposures during basket-weaving; and assessing marine exposures to surfers. She has been affiliated for 12 years with the Western Region Hazardous Substances Research Center and worked as a visiting scientist of the Environmental Policy and Risk Management Group at the Pacific Northwest National Laboratory. She serves on the National Academies/National Research Council Committee on Water System Security Research, as a member of the Board of Scientific Counselors, the executive advisory board for EPA’s Office of Research and Development, and is a member of the Oregon Environmental Public Health Tracking Advisory Board. Dr. Harding received her Ph.D. degree in Public Health from Oregon State University.

Preston D. Hardison is an environmental policy analyst and biocultural landscape restoration specialist with the Tulalip Tribes of Washington with training in evolutionary biology and conservation biology. With the Tulalip Tribes, he is involved in the development of the “Cultural Stories Project,” specifically the design of software and methodologies for recording tribal environmental history and traditional ecological knowledge to develop environmental baselines for biocultural landscape restoration. He also is developing tribal protocols for accessing this information. Mr. Hardison represents the Tulalip Tribes in meetings of the World Intellectual Property Organization (WIPO) on the protection and use of traditional knowledge.

Since 1995, he has participated in the Convention on Biological Diversity (CBD) and serves on a global panel of the CBD to review the status of and trends in the preservation and promotion of traditional knowledge. He has been working closely with representatives of indigenous communities on issues relating to the implementation of Article 8(j) and other articles of the Convention that refer to nation-

states' obligations to "preserve, promote, and respect" traditional knowledge related to the conservation of biodiversity. He is interested in developing new relationships between academics, governments, citizens, and tribes that promote respect for tribal traditions, the equal standing of native science with Western science, and the use of traditional knowledge for environmental management and restoration. He publishes on policy issues related to the protection and use of traditional knowledge.

Barbara Harper is a risk assessor and board-certified toxicologist. She received her Ph.D. degree from the University of Texas at Austin. While on the faculty at the University of Texas Medical Branch at Galveston, she lectured in toxicology, environmental health, and related topics. She then worked for the Pennsylvania Department of Environmental Resources, and taught risk assessment at Penn State Harrisburg. She joined Battelle's Pacific Northwest National Laboratory as a program manager in risk assessment (at the Hanford Site), where she started working on tribal risk issues with Stuart Harris. She is now the Environmental Health Program Manager for the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Department of Science and Engineering and is a Research Associate Professor at Oregon State University in the Department of Public Health. Dr. Harper is principal investigator on an EPA grant to develop regional exposure scenarios for several Tribes. She just finished a 6-year term on EPA's Science Advisory Board and has published more than 25 peer-reviewed papers and many other reports on tribal health risks from toxics in fish and other resources and tribal exposure pathways.

Stuart G. Harris is the Director of the Department of Science and Engineering at the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). Mr. Harris is a geologist and tribal risk assessor and is enrolled in the CTUIR. He received a B.S. degree in General Sciences from Eastern Oregon University in 1982 and a B.S. degree in Geology from Oregon State University in 1992. He has worked as a chemical spill team leader at Hewlett Packard and as a natural resource specialist for the Nez Perce Tribe. He served as a Natural/Cultural Resources Coordinator in the CTUIR Environmental Sciences and Technology Program and became manager of that program in 2003. When the program was elevated to departmental status in 2004, he was named department director. Mr. Harris has been working in tribal risk assessment since 1995 and has published several papers and many reports. He has given many lectures and training presentations on Tribal exposure pathways, environmental justice, cultural risk, fish toxics, and Tribal science.

Dena Hartzell received her bachelor's degree from Kutztown University of Pennsylvania in Environmental Science with a concentration in Biology in 2001. She worked as a fisheries observer for the National Marine Fisheries Service in Alaska and as a solid waste inspector for the Pennsylvania Department of Environmental Protection in Reading, Pennsylvania, before attending Oklahoma State University's graduate program in 2003. She completed her Master's degree in Zoology by completing a thesis entitled "An Evaluation of an Index of Biological Integrity for Depressional Wetlands in Central Oklahoma". She has been working for the Iowa Tribe of Oklahoma as their wetland and environmental scientist for one year. The program is funded by EPA CWA 106 grants and deals with water quality of creeks and wetlands as well as the development of water quality standards. Her professional interests include wetland assessments, macroinvertebrates, birds, water quality assessments, and regulatory inspections.

Andrew Hendrickson is the Tribal Liaison for FEMA Region 10, assigned to support preparedness and response efforts for federally recognized Tribes in Oregon and Washington states. He is a Seattle native and has worked for the Regional office in Bothell, Washington, since 1988. He has responded to Hurricane's Hugo (1989), Inik (1992), Katrina, the Nisqually earthquake, 9/11, and numerous other disasters.

Kathleen Shaye Hill is currently the primary partner for Quail Plume Enterprises. Her work includes consulting with Tribes with regard to planning and management for environmental compliance and

drafting various ordinances and processes, among other efforts. She was an Assistant Professor for the Native American Studies Department at Humboldt State University where she taught courses on issues pertaining to Native American and other indigenous peoples. In addition, Ms. Hill served as the EPA Regional Tribal Office Director in Region 10. She has worked as a grants writer and was elected to serve as the Tribal Secretary for the Klamath Tribe Executive Committee, Klamath Tribes, in Chiloquin, OR.

Margaret Hiza-Redsteer is currently a research scientist in the geologic discipline of the U.S. Geological Survey (USGS), Earth Surface Processes Team, where she has been employed since October 1999. She is project chief of the “Navajo Land Use Planning Project,” at the Flagstaff Science Center in Arizona. She works on the Navajo Nation conducting geologic mapping, climate and land use history, and assessing drought impacts, wind erosion, and water quality. Outside of her USGS work, she has been a reviewer for the 2007 IPCC as-assessment on Global Climate Change, a consultant on several National Science Foundation (NSF) Grants to aid Native Americans in assessing and coping with climate change on Native Lands, and a consultant for Little Bighorn Tribal College/AIHEC to develop science curriculum and culturally relevant research projects at tribal colleges. Her education includes a B.S. degree in Geology with extended hydrogeology emphasis from NAU, where she graduated Cum Laude (1989), an M.S. degree from Montana State University (1993), on Sedimentary Processes in Volcanic Systems, funded by an NSF fellowship, and a Ph.D. degree from Oregon State University, on the history of the Absaroka Province, Greater Yellowstone, Wyoming and Montana, (1999). She is of Crow Indian descent, mother to three Crow/Navajo children, and lived in the Joint Use Area of the Navajo Nation for 10 years in what are now Hopi Partitioned Lands.

Mark Huston received a B.S. in Biology from East Stroudsburg University and an M.S. in Biology from the University of Wisconsin-LaCrosse. He currently works for the U.S. Fish and Wildlife Service in the Division of Environmental Quality. Previously, he worked as a National Technical Liaison with the U.S. Fish and Wildlife Service, stationed at the U.S. Environmental Protection Agency’s Environmental Response Team Center in Edison, New Jersey. Prior to joining the U.S. Fish and Wildlife Service, he was a Biologist with Roy F. Weston, Inc. Mr. Huston’s responsibilities include reviewing and assisting with Natural Resource Damage As-assessment and restoration cases as well as being the Service’s representative on the Department of Interior’s Restoration workgroup. In addition, he has been previously involved with developing, conducting, and assisting with ecological risk assessments of hazardous waste sites located on and off service lands, and assists with the development of clean-up goals for these sites.

Richard Keck has been working with the Cherokee Nation and the Inter Tribal Environmental Council (ITEC) for 4 years. Currently heading up the Clean Water department, he has also worked with solid waste issues, including open dumpsite assessment, and landfill compliance issues. With a degree in Chemistry, Richard is also a Registered Sanitarian, and Environmental Specialist, and is a certified Trimble GPS Instructor.

Tim Kent received a B.S. in Geology and Geophysics from Texas Tech University in 1981 and has completed postgraduate work at Oklahoma State University and at the University of Texas in Hydrogeology and Environmental Engineering. Mr. Kent has held positions as a geophysicist and hydrogeologist at Petroleum Exploration companies and consulting firms for more than 20 years. He took his present position as the Environmental Director of the Quapaw Tribe of Oklahoma in 2002. Special interests include groundwater and surface water contaminant transport and environmental geophysics.

Lon Kissinger has an M.S. degree in Environmental Toxicology from Cornell University in Ithaca NY. After working in the biotechnology industry for 5 years, he joined the Washington State Department of Ecology in 1990. At Ecology, his initial project was implementation of Washington State's Superfund regulation, the Model Toxics Control Act. Following this, Lon worked on air toxics issues and development of a relational database to support Ecology's Air Quality Program. From 1998 to 2001, Lon

worked on revising Washington State's sediment management standards as well as human health risk assessment issues related to the cleanup of contaminated sediment sites. Lon joined EPA Region 10 in late 2001, working in the Risk Evaluation Unit of the Office of Environmental Assessment. At EPA, Lon deals with contaminated sediment Superfund sites and risks posed by contaminants in seafood. Lon is particularly concerned with seafood contaminant risks for groups with high seafood consumption rates, such as Tribes and ethnic communities.

Kevin Koski is employed by Bois Forte Environmental Services, a division of the Bois Forte Band's Department of Natural Resources. Their Indoor Air Quality Program, funded since 2001 by EPA Region 5 under Section 103 of the Clean Air Act, provides indoor air quality inspection services to band members and assistance to homeowners and the Bois Forte Housing Department. Deemed a "Center of Excellence" by EPA Region 5, the program also provides inspection services, technical assistance, and training opportunities to other tribes in Minnesota, Wisconsin, Iowa, and Michigan. Since the program began, two QAPP's have been created and approved, investigations have been completed in more than 300 homes and public buildings, and several community meetings and training sessions regarding indoor air quality issues have been organized on the Bois Forte Reservation.

Daniel H. Kusnierz is the Water Resources Program Manager for the Penobscot Indian Nation on Indian Island, Maine. He received his Western scientific training from the University of Vermont, Burlington (B.S. degree in Wildlife Biology) and the University of Maine, Orono (M.S. degree in Wildlife Management). He has been the Manager of the Penobscot Indian Nation's Water Resources Program since January 1993. In this capacity, he oversees many water resource-related projects conducted by the tribe, including a watershed-wide water quality monitoring program: studies of contaminant levels in fish, aquatic wildlife, and sediments; assessments of water quality using aquatic invertebrates; and studies of cumulative impacts. The program also participates in many permitting, licensing, and regulatory proceedings that affect the Penobscot Reservation and its aquatic resources.

Mr. Kusnierz serves as the tribal coordinator for the model water quality monitoring cooperative agreement between Penobscot Nation and ME DEP. He also has served on numerous committees, including the Technical Advisory Committee for Maine's Surface Waters Ambient Toxics Program and the Maine Dioxin Monitoring Program, the Maine Council on Environmental Monitoring and Assessment, and participates on EPA's Regional Tribal Operations Committee. He is a District Supervisor for the Penobscot County Soil and Water Conservation District and is the Region I tribal representative to EPA's National Tribal Science Council.

Martina R. Lauterbach received her B.S. degree in 1976. She was a Pediatric Nurse Program Manager for the Alaska Native Medical Center from 1978 to 1988 and she was a research nurse from 1988 to 1990 for the Arctic Investigations Program in Anchorage, Alaska. She attended Alaska Pacific University (Alaska Methodist University). From 1990 to 1992, she was the Pediatric Hepatitis B Program Coordinator for the Arctic Investigations Program and worked as a community health nurse for the Alaska Native Medical Center from 1992 to 1996 in Anchorage, Alaska. In addition, she worked as a pediatric nurse field health specialist for the South Central Foundation for Primary Care from 1996 to 2003. Since 2003 she has worked as the Pediatric Nurse Program Manager for the Alaska Native Tribal Health Consortium. She received honors from the U.S. Department of Health and Human Services, a Group Performance Citation (1994), Anchorage Federal Executive Association Outstanding Performance, Achievement and contribution as a federal employee (1996), and received a Head-start Certificate of Appreciation.

Rachel Lovell Ford is a Water Resources Specialist in the Swinomish Office of Planning and Development. She received her B.S. in Environmental Science with a minor in Environmental Education

from Western Washington University. Her research at Swinomish has focused on tideland natural resources as well as monitoring, data management, and analysis of the Tribe's water resources.

Oren Lyons is the Faithkeeper of the Turtle Clan, Onondaga Council of Chiefs of the Haudenosaunee of the Onondaga Nation. Born in 1930, he was raised in the traditional lifeways on the Seneca and Onondaga reservations. In 1982 he helped establish the United Nations Working Group on Indigenous Populations where he has participated in the Indigenous Peoples Conference in Geneva, an international forum supported by the United Nations' Human Rights Commission. He is a principal figure in the [Traditional Circle of Indian Elders](#), a council of traditional grassroots leadership of North American Indian Nations. In 1992 he was invited to address the General Assembly of the United Nations and [open the International Year of the World's Indigenous People](#) at the United Nations Plaza in New York. During that year he organized a delegation of the Haudenosaunee to the UN [Conference on Environment and Development \(UNCED\) in Rio de Janeiro](#) and was invited by UNCED Secretary General Maurice Strong, to address the national delegations.

Chief Lyons is also co-editor with John Mohawk of [Exiled in the Land of the Free: Democracy, Indian Nations, and the U.S. Constitution](#) (Clear Light: 1992). He is [Professor of American Studies](#) at the State University of New York (SUNY) at Buffalo where he directs the Native American Studies Program and teaches undergraduate courses in Surveys of Native American History and a Native American Studies Colloquium.

Anthony Madrigal (Cahuilla) received his Ph.D. in History, writing in the field of historic preservation and Native American History. He is an attorney and has worked for the Twenty-Nine Palms Band as environmental counsel and as a cultural resource specialist. He also works with his own tribe, the Cahuilla Band of Indians, and several other tribes in the area of natural and cultural resource preservation. He has written on traditional tribal sovereignty and its relationship with the natural world.

Larry Mercurieff has almost four decades of experience serving his people, the Aleuts of the Pribilof Islands and other Alaska Native peoples in a number of capacities. His reach has been broad and varied; a few of the positions he has held include: City Manager of St. Paul Island, Commissioner of the Alaska Department of Commerce & Economic Development (a cabinet post), President and CEO of Tanadgusix (A.K.A. TDX) Corporation, and Deputy Director of the Alaska Native Science Commission. He served as the Director of the Department of Public Policy and Advocacy in the Rural Alaska Community Action Program.

Related to the Bering Sea issues, Mr. Mercurieff served on the National Research Council Committee on the Bering Sea Ecosystem, and was one of four Native Americans to present at the White House Conference on the Oceans during the Clinton administration. He was selected by Aleut leaders to be part of a 1-hour Discovery Channel documentary about the history and spiritual aspects of Aleuts that was seen by an estimated 60 million people worldwide. In 2004, he received the Alaska Native Writers on the Environment Award from the Alaska Conservation Foundation and, in 2006, he received the Rasmuson Foundation Award for Creative Nonfiction and was one of four who received recognition in the Buffett Award for Indigenous Leadership.

As the Coordinator for the Bering Sea Council of Elders, he works with some of the most revered Elders from seven regions throughout Alaska, focused on the health of the Bering Sea ecosystem and the viability and health of the coastal and river cultures dependent on it. He has shared Elder wisdom locally, nationally and internationally, and his writings and interviews have appeared in such publications as the Winds of Change, YES, Red Ink, Alaska Geographic, Smithsonian, National Geographic, and Kindred Spirits. He was featured in the National Wildlife Federation Magazine as an "American Hero," having called national and international attention to major adverse changes in the Bering Sea ecosystem.

Phil Mercurio received a B.Sc. degree in Environmental Science with an emphasis in Biology from Northern Arizona University in 1998. He received his B.Sc. Honors in Marine Chemistry in 1999 and an M.S. in Environmental Chemistry and Toxicology in 2002 from James Cook University in Townsville, Queensland, Australia. His Master's thesis focused on the determination of relative biodegradability and toxicity of vegetable-based lubricating oils and comparable petroleum lubricants. In 2003, he began working at the Mote Marine Laboratory in Sarasota, Florida, where he serves as a Laboratory Assistant to Dr. Dana Wetzel.

Catherine Michaud is a Senior Research Scientist at the Harvard Initiative for Global Health. Dr. Michaud has a medical degree from the University of Geneva, Switzerland and received her M.P.H. at Harvard School of Public Health in 1988. She has worked as a Pediatrician in Switzerland and became involved in the Global Burden of Disease and Injury Studies when it began in 1990. She is the lead author of the report "U.S. Burden of Disease and Injury Study 1996." Other areas of work include the analysis of international resource flows for health and health research.

Pamela K. Miller is the founder and director of Alaska Community Action on Toxics (ACAT). ACAT is an organization that focuses on environmental health and justice issues. As a biologist, she brings 25 years of research, education, and advocacy experience to her present work. From 1990 to 1997 she was researcher/campaign coordinator for Greenpeace, Alaska, working on ocean ecology, oil and gas, toxics, and climate change issues. Prior to coming to Alaska, she served as Ocean Issues Technical Coordinator for the Washington Department of Ecology and Director of a marine science education center at Nisqually Reach in southern Puget Sound. She received the 1991 Governor's Award for Environmental Excellence in Washington State. She received the Alaska Conservation Foundation's Olaus Murie Award in recognition of her "long-term outstanding professional contributions to the conservation movement in Alaska." She holds a bachelor's degree in Biology from Wittenberg University and a Master's degree in Environmental Science from Miami University. She serves as Principal Investigator for research projects funded by the National Institute of Environmental Health Sciences and the U.S. Environmental Protection Agency.

Karen Mitchell is a geologist in the Swinomish Tribe's Planning Office. She received her B.A., in Geology from the University of Minnesota, Morris and an M.S. in Geology from Washington State University. Her research at Swinomish has been focused on the Tribe's near-shore processes and groundwater resources, including developing a numerical groundwater model.

Todd Mitchell, a Swinomish Tribal member, is the Water Resources Program Manager in the Swinomish Office of Planning and Development. He graduated from Dartmouth College with a B.S. in Geology. He continued his studies at Washington State University and graduated with an M.S. in Geology specializing in hydro-geology, igneous petrology, and geochemistry. His research while employed by Swinomish has been focused on the Tribe's water resources, including tidelands, surface water, groundwater, wetlands, and habitat restoration research.

Daniel Mosley (Paiute/ Sioux), Environmental Specialist, has worked with the Pyramid Lake Paiute Tribe in this position since 1998. Prior to this, Dan has worked as a Tribal Game Warden, Fish Culturalist, and Resource Technician for the Tribe. Dan has represented the Tribe on many issues relating to Water Quality, Fish recovery, bioassessments, water flow management, and bioassessment program since 1989. Dan has been married for over 28 years to Rhonda (Shoshone/Sioux) who teaches 3rd grade. Together they have five children and three grandchildren.

Curtis Munoz is a full blooded Indian of Kiowa and Muscogee Creek heritage. He is a graduate of Cameron University in Lawton, Oklahoma where he received a degree in chemistry/biology emphasizing

biochemistry and molecular biology. He also is an alumnus of the Four Directions Summer Research Program at Harvard Medical School. His research field was bacterial genetics in the Department of Molecular Genetics and Microbiology with Dr. Roberto Coulter as his PI. Currently he serves as the Environmental Director of the Kiowa Tribe of Oklahoma and is the EPA National Tribal Science Council Region 6 representative.

William Nichols is the Tribal Coordinator for the Office of Emergency Management (OEM) in the OEM Regulatory and Policy Development Division, Washington, DC., whose main mission is to prevent prepare and respond to oil and chemical spills. He has been with the U.S. EPA in the Oil Program for nearly 10 years and specializes in oil spill mitigation and response policy. He has an M.S. degree in Environmental Science from Johns Hopkins University and a B.A. degree in Economics from Salisbury State University, both in Maryland.

Jeff Ogburn is the Water Quality Specialist for the Taos Pueblo Environmental Office. He graduated from The Evergreen State College in Olympia, Washington, in 1994 and has worked in the environmental field ever since. He has a diverse background of professional experience spanning wildlife biology, air quality, water quality, environmental compliance, consulting, and education. His career has placed him on various environmental monitoring projects throughout the Americas, often in remote and challenging conditions. With roots as a “mercenary biologist” he has worked for various agencies, nonprofits, and within the private sector as a technician, scientist, and project manager. In 2004, he was hired by the Taos Pueblo Environmental Office to maintain the Water Quality Standards Program and help forward Taos Pueblo’s goals in Natural Resource Management.

Patricia Olson is a co-founder and was the Principal Scientist for the Pacific Watershed Institute, a 501 (3)(c) non-profit organization dedicated to integrating ecosystem science and research into natural resource management and education. Currently, she works for the Washington Department of Ecology where she is the hydro-geologist for the Shoreline and Environmental Assistance Program. Her position provides technical and scientific assistance on hydrologic and geomorphic issues related to shoreline, floodplain, and wetland management. She has a Ph.D. degree in Forest Hydrology with a minor in Ecosystem Analyses from the University of Washington. She received a Master’s degree in Fluvial Geomorphology from the University of Calgary. Her professional accreditations include registration in Washington as a Licensed Hydrogeologist (LHG). Her current research focuses on interactions between surface and subsurface water, heat transport to streams, and plant-water interactions in hyporheic, forested riparian and associated upland ecosystems under different forest management prescriptions. Previous research has included nutrient and carbon cycling between stream, riparian, and upland areas. Other research interests include riparian ecohydrology (plant-groundwater interactions) and the connections between hydrology and geomorphology in creating landscape features at varying scales (e.g., groundwater geomorphology) and their influence on vegetation patterns.

Lydia Olympic is the past President of the Igiugig Village Tribal Council and currently serves as a council member. She was the executive health board member for the Bristol Bay Area Health Corporation, has been a board member of the Native American Rights Fund, and is on the steering committee for Western Mining Action Network. She is serving as an elected tribal leader on EPA’s National Tribal Operations Committee and Regional Operations Committee for Region 10. She is an avid college basketball fan and berry picker.

Jennifer Ousley has a B.S. degree in Environmental Biology from Eastern Illinois University. She worked for the Illinois State Geological Survey for nine years and is currently EPA Region 7’s Section 106 Tribal Grants Coordinator.

John Persell has been employed by Minnesota Chippewa Tribal Government since 1978. He began as a Water Quality Planner with the Minnesota Chippewa Tribe shortly after graduating from Bemidji State University (Bemidji, Minnesota) with a B.S. in Biology and Chemistry. He founded the Minnesota Chippewa Tribe Research Laboratory in 1979, achieving EPA certification for the laboratory in 1987. Laboratory activities focus on drinking water, surface water, soil, sediment and tissue analyses for Tribal environmental quality management and policy assessment.

As part of the Tribe's assessment and communication of risks associated with food contaminants, he has devoted considerable time to understanding the potential health impacts of these contaminants. He has served on the Executive Board of the National Tribal Environmental Council (NTEC) and as a member of the NTEC Superfund Technical Working Group and the EPA Tribal Science Council. He is a recipient of EPA's Superior Program Award for the EPA Environmental Justice Grant: "Assessing and Communicating Risk: A Partnership To Evaluate a Superfund Site on Leech Lake Tribal Lands, 1997-2003."

In June 2006, he began employment with the Leech Lake Band Government of the Minnesota Chippewa Tribe. He is a veteran of the U.S. Air Force, a father and grandfather, and particularly enjoys family and outdoor activities.

Troy Pierce has served in an Intergovernmental Personnel Act position negotiated between the Poarch Band of Creek Indians and the US EPA since March 2005. Troy works as a scientist in the Tribe's Environmental Department. Born in Wichita, Kansas, Troy was raised in both Kansas and Oklahoma. Troy has a Ph.D. from Oklahoma State University with most of his career focused on agricultural water quality and pesticides issues.

Robin Powell is an environmental specialist. She is the Environmental Manager for the Pyramid Lake Paiute Tribe. Her work covers a broad number of programs including: General Environmental Program, Solid Waste Program, Pesticide and Integrated Pest Management Program, Integrated Weed Management Program, Environmental Education Program cross media, Lead Awareness and Outreach Program, Species Conservation (Sage Grouse and Big Horn Sheep), and West Nile Virus Monitoring Program.

James W. Ransom is serving his second term as Chief of the St. Regis Mohawk Tribal Council. He has worked for the St. Regis Mohawk Tribe and community of Akwesasne for the past 28 years in various capacities. Chief Ransom has extensive experience on environmental issues. In 1978, he helped start the St. Regis Mohawk Tribe's Environment Program and served as its Director through 1990. More recently, Chief Ransom served as the first director of the Haudenosaunee Environmental Task Force. In that capacity, he helped develop environmental programs for Cayuga, Onondaga, Tonawanda Seneca, and Tuscarora Nations. In the 1990s, Chief Ransom served on the New York State Superfund Management Board, originally appointed to the Board by Governor Mario Cuomo and later reappointed by Governor George Pataki. He also has served on the U.S. Environmental Protection Agency's Tribal Science Council.

Chief Ransom served as one of the lead negotiators in the Tribe's land claim settlement with the State of New York. He also helped raise Mohawk environmental and cultural concerns during the re-licensing of the St. Lawrence-FDR hydroelectric project on the St. Lawrence River. Chief Ransom holds a B.S. degree in Civil Engineering from Clarkson University as well as an Associates Degree from Canton Agricultural and Technical College in Civil Technology.

Elizabeth Resek is currently the Deputy Director for the Office of Science Coordination and Policy within the Office of Prevention, Pesticides and Toxic Substances (OPPTS) at the U.S. Environmental Protection Agency (EPA). Her office deals primarily with pesticides/toxics, endocrine disruptors and

biotechnology. She is responsible for the Tribal LifeLine Project, which involves developing exposure and risk assessment tools for Tribal communities and other unique subpopulations. She also represents OPPTS on the Tribal Science Council. She worked previously in EPA's Office of Pesticide Programs (OPP) for almost 12 years as a chemist, special assistant, and where she created the OPP Tribal Program. She left EPA in 2000 and worked as a private consultant in public-private partnering, specifically on economic development and sustainability issues. Most recently, she was employed by the Federal Emergency Management Agency before returning to EPA in 2003. She has a Bachelor's degree in Chemistry from the College of Wooster and a Master's in Chemistry from the University of Maryland.

John E. Reynolds, III, graduated Cum Laude with Departmental Honors in Biology from Western Maryland College (now McDaniel College) in 1974. He received his M.S. and Ph.D. degrees in Biological Oceanography from University of Miami's Rosenstiel School of Marine and Atmospheric Sciences in 1977 and 1980, respectively. His thesis and dissertation dealt with behavioral ecology and functional morphology of manatees. Following graduation, he was employed at Eckerd College, St. Petersburg, Florida, from 1980-2001, where he served as Professor of Marine Science and Biology and Chairman of the Natural Sciences Collegium; he was integral in establishing the college's renowned marine science major.

In 1989, Dr. Reynolds became a member of the Marine Mammal Commission's Committee of Scientific Advisors on Marine Mammals; in 1990, he became Chair of the Committee. In 1991, he was appointed by President Bush to serve as Chairman of the Marine Mammal Commission, a position for which Presidents Bill Clinton and George W. Bush retained him. In 2001, Dr. Reynolds began working for the Mote Marine Laboratory in Sarasota, Florida, where he serves as Senior Scientist and Manatee Research Program Manager. That same year, he became Co-Chair of the IUCN Sirenian Specialist Group. Dr. Reynolds was elected to serve as President of the international Society for Marine Mammalogy, for the period 2006-2008. He is a member of Phi Beta Kappa, has received awards for his teaching, leadership, and scholarship, and has published nearly 200 papers, abstracts, and books.

Toni Richards is the Air Quality Specialist in the Bishop Tribe's Environmental Management Office. She has been working with the Bishop Tribe for nearly eight years and has been with the Air Program since its inception in 2001. Prior to that, she was the Interim Tribal Administrator and Assistant Tribal Administrator. Before coming to the Tribe, she worked in health policy research. She has a doctorate in Sociology from the University of Michigan.

As the Air Quality Specialist, Dr. Richards is responsible for establishing and maintaining the Tribe's meteorological and PM10 and PM2.5 air quality monitoring for program. The Bishop Tribe's Air Program works collaboratively with other tribes in the region and with the Great Basin Unified Air Pollution Control District. Tribal data are available in real time through the Tribal Environmental Exchange (TrEx) Network (<http://wxweb.meteostar.com/tribal/>) and on the Bishop Tribe's own Web site (<http://www.bishoptribeemo.com/>).

In 2006, she developed tribal air quality standards for the Reservation for PM10, PM2.5, ozone, and carbon monoxide. These standards parallel those for the State of California and have been adopted by the Bishop Tribal Council. In addition to ambient monitoring, she also provides indoor air quality assessments on an as-needed basis for carbon monoxide, carbon dioxide, particulate matter, radon and common aerosols (such as mold and pollen). She also is responsible for issuing burn permits to tribal members.

Chris Riggio grew up in Southern California and graduated in 1988 with a B.S. degree in Civil Engineering from the University of California at Davis. He was subsequently commissioned as an officer into the U.S. Air Force (USAF) under a USAF ROTC college scholarship program. During his 4-year

military tour of duty, his focus was on cleanup and restoration of contaminated sites on Kirtland Air Force Base in Albuquerque, New Mexico. He also is a veteran of the first Persian Gulf War.

Mr. Riggio has worked for various different engineering and environmental consulting firms since moving to Alaska in 1993. Currently, the Federal Sites Restoration Coordinator and staff Civil/Environmental Engineer, Mr. Riggio has been with the Aleutian Pribilof Islands Association, Inc. (APIA) since 1999. APIA is an Alaska Native non-profit consortium that works under the direction of the 13 Aleut Tribes. Mr. Riggio's undertakings at APIA include providing technical environmental and civil engineering assistance to Aleut Tribes on a variety of issues, including wastewater, solid waste, safe drinking water, petroleum storage, and related issues, striving towards creating safe, healthy, and sustainable communities.

Mr. Riggio's outside interests include activism in social and environmental justice issues. He also is co-founder of the Alaska Earth Institute, a non-profit organization dedicated to increasing awareness of the impacts of Western lifestyles on the planet. Mr. Riggio is an amateur mycologist and teaches classes on Alaska's wild mushrooms at the University of Alaska Anchorage and through other venues. His outdoor interests include mountaineering, backpacking, rock climbing, sea kayaking, and collecting and preserving healthy wild foods such as fish, berries, and mushrooms.

LT Troy L. Ritter is a Registered Environmental Health Specialist and is a graduate of the University of Massachusetts' Master of Public Health in Public Health Practice program, a Diplomate of the American Academy of Sanitarians, and a Commissioned Officer with the U.S. Public Health Service. He has seven years of environmental health practice and management experience, and has spent the majority of his career working to improve the health of the Alaska Native people.

In his current position, LT Ritter provides advanced environmental health technical consultation and solutions for the Alaska Native Tribal Health Consortium (ANTHC). As the largest tribally managed health organization in the United States, ANTHC works with its partners to provide comprehensive public health and health care services for approximately 120,000 Alaska Natives. Previously, LT Ritter served as Chief Environmental Health Officer for the Yukon Kuskokwim Health Corporation, where he was responsible for ensuring comprehensive environmental health services for 64 federally recognized Tribes within a geographic region approximately the size of Ohio.

LT Ritter has specialized knowledge of the relationship between water-washed disease (disease brought about by inadequate hand and body hygiene) and availability of modern water service, small utility operation and management, environmental health program planning and evaluation, control of community-based methicillin-resistant *Staphylococcus aureus*, and health implications and issues of fluorides.

Melinda Ronca-Battista somehow managed to attain two degrees in physics from the University of Michigan without ever understanding football. Following college, she worked for about 20 years in the radiation protection field (which explains her odd behavior). She held positions with USEPA in Washington D.C and as a private contractor; whenever she was not with EPA; Melinda conducted audits of radiation handling programs at military sites, laboratories, radiopharmaceutical manufacturers, and nuclear power plants. About five years ago, Melinda began working for Northern Arizona University's Institute for Tribal Environmental Professionals as the sole technical person in the Tribal Air Monitoring Support Center (she hopes her lonely days will soon be over, there are two open positions!). She teaches three classroom course every year as well as two online courses in data management and quality assurance. She is looking forward to starting two more online courses this year and to continue helping tribes on an individual basis with data management, QC, and the creation of Quality Assurance Project Plans.

Lanya Ross was born and raised in southwestern Minnesota. She has a B.A. degree in Geology from Macalister College in Saint Paul, Minnesota, and a M.S. degree in Geology from Northern Arizona University in Flagstaff, Arizona. She has worked with the Shakopee Mdewakanton Dakota Community (SMDC) since 2001, where her focus is source water protection. Current projects include: updating the SMDC Wellhead Protection Plan to reflect changes in local and regional water use; mapping glacial sand deposits to determine if there is a reservoir capable of storing and transmitting injected effluent from a newly constructed wastewater treatment facility; coordinating with adjacent municipal, county, and state organizations to conduct aquifer tests; and overseeing the SMDC well abandonment program.

Hiram Sarabia of the University of California–San Diego SBRP Research Translation Core is a scientist who investigates applications of emerging biomolecular technologies in environmental monitoring, risk assessment, and restoration. He also is a founding member of the JA JAN Coalition and has ten years of research and professional experience in the field of environmental monitoring and assessment. He is defending a Master of Science in Marine Science degree, with an emphasis on coastal pollution, from the University of San Diego.

Dolores Savignano received a B.S. degree in Biology from Yale University and a Ph.D. degree in Zoology from the University of Texas at Austin. She currently works for the U.S. Fish and Wildlife Service (USFWS) in the Division of Environmental Quality, is the Restoration Coordinator for the Natural Resource Damage Assessment and Restoration (NRDAR) Program, and serves as the alternate representative on the DOI Restoration Work Group.

Previous USFWS positions include Northeast Regional NRDAR, Superfund and Oil Spill Coordinator, and Supervisor of the Las Vegas, Nevada SubOffice. She has worked in the NRDAR program for ten years. Prior to joining the USFWS, she worked for a consulting firm on Superfund risk assessments, review of remedial investigations, and a variety of policy studies related to pesticides.

Rita Schoeny is a Senior Science Advisor for the U.S. Environmental Protection Agency's (EPA) Office of Water. She received her B.S. degree in Biology at the University of Dayton and a Ph.D. degree in Microbiology from the School of Medicine of the University of Cincinnati. After completing a postdoctoral fellowship at the Kettering Laboratory, Department of Environmental Health, she was appointed as an Assistant Professor in that department of the U.C. Medical School. Dr. Schoeny has held several adjunct appointments and regularly lectures at colleges and universities on risk assessment and has been published on a wide variety of topics.

Dr. Schoeny joined the U.S. EPA in 1986. Prior to her current position, she was an Associate Director of the Health and Ecological Criteria Division of the Office of Science and Technology. In that position, she was responsible for managing major assessments and programs in support of the Safe Drinking Water Act, including scientific support for rules on disinfectant by-products, arsenic, microbial contaminants, and the first set of regulatory determinations from the Contaminant Candidate List. She has held various positions in the Office of Research and Development, including Chief of the Methods Evaluation and Development Staff; Environmental Criteria and Assessment Office, Cincinnati; Associate Director NCEA-Cincinnati; and Chair of the Agency-wide workgroup on cancer risk assessment.

Nancy Schuldt is the Water Projects Coordinator for the Fond du Lac Band of Lake Superior Chippewa, and has been working for the Band since September 1997. She has a B.S. degree in Biology from the University of Dayton, and a Master's degree in Aquatic Ecology from the University of Kansas. She has been involved in developing Fond du Lac's water quality standards program which includes a comprehensive water quality monitoring program, assessment and reporting, data management and analysis, and criteria development. She is also responsible for the Band's Nonpoint Source Management

Program, and numerous water resource investigations related to protecting and restoring Reservation waters.

Allen Sedik received a B.S. degree in Civil Engineering from Wayne State University in Detroit, Michigan. He currently serves as the NRDAR Program Manager for the Department of Interior's Bureau of Indian Affairs. He served as an officer in the U.S. Air Force from 1967 to 1971, and his career included working: for the Michigan State Department of Highways as a Construction Engineer; for the Michigan Air National Guard as a Base Civil Engineer; for the Presque Isle Corporation as a Project Engineer; as a Project Engineer; as a Private Contractor; as a Consultant; and for the Bureau of Indian Affairs (BIA) as an Environmental Scientist. He has 27 years of Government service, of which 16 have been with the BIA, the last six years of which have been in the BIA Central Office located in Washington, DC.

Jill Silver is the Executive Director and Watershed Program Manager for the non-profit 10,000 Years Institute. She is an environmental scientist with project experience in watershed assessment, development of watershed-scale conservation programs, and fish habitat restoration. She developed natural resource management programs for the Hoh Indian Tribe that included geomorphic, biological, and hydrological research specific to improving regulatory protection of tribal and public resources. Ms. Silver has designed and implemented restoration of stream, wetland, and riparian habitats at sites impacted by timber harvest, road construction, and invasive plant species. Ms. Silver's academic training is in stream and wetland ecology, geomorphology, and community planning. She has worked extensively on the Olympic Peninsula of Washington State in the Hoh River watershed, where she coordinates multidisciplinary teams to address the complex needs of sustainable resource management. Ms. Silver has been an effective advocate in regulatory and educational forums addressing fish and wildlife habitat protection, successfully interacting with a diverse group of resource and regulatory professionals to understand and address effects of resource management and development on riparian and aquatic ecosystems.

CAPT Jeff Smith is a Registered Sanitarian. He received his graduate degree from the University of Minnesota and is a Diplomat of the American Academy of Sanitarians and a Commissioned Officer with the U.S Public Health Service. He has seven years of environmental health practice and management experience, and has spent the majority of his career working to improve the health of the Alaska Native people.

CAPT Smith directs the statewide environmental health program for the Alaska Native Tribal Health Consortium (ANTHC). Programs under the direction of CAPT Smith include Environmental Health Coordination, Injury Prevention, Institutional Environmental Health, Construction Safety, Water Fluoridation and Risk Management. As the largest Tribally managed health organization in the United States, ANTHC works with its partners to provide comprehensive public health and health care services for approximately 120,000 Alaska Natives.

Previously, CAPT Smith served as Deputy Director of the Indian Health Service Environmental Health program in Alaska as well as the Director of the Bristol Bay Health Corporation Office of Environmental Health and Safety. CAPT Smith has more than 20 years of experience in working with and providing environmental health services to Alaska Natives and American Indians.

Paula Stigler is an environmental health scientist currently working with the Pala Band of Mission Indians Environmental Department as an Air Quality Specialist and border infrastructure program coordinator. She has been working with the indigenous communities of Baja California-Mexico for almost 5 years and also is a member of the JA JAN Coalition. She is defending a Master of Science in Public Health degree at San Diego State University, with an emphasis on Water Quality and Nutrient Modeling.

William Swaney is director of the Environmental Science Department at Salish Kootenai College (SKC). He worked for the Confederated Salish and Kootenai Tribes for 15 years before coming to SKC. His experience includes wildlife biology and environmental protection program management.

David Taylor has been a Senior Document Reviewer in EPA's Pacific Southwest Region (Region 9) for the last 11 years, where his responsibilities include providing technical and Quality Assurance (QA) support for tribes, states, and other grantees, reviewing QA documents such as QA Plans and Sampling Plans, and conducting training. Prior to joining EPA, he worked for a several different environmental consulting firms and environmental laboratories, primarily supporting QA activities at various EPA Research Laboratories and with EPA's headquarters Quality Staff. He has a Bachelor of Science degree in Chemistry from the University of Michigan, Master's and Ph.D. degrees in Inorganic Chemistry from the University of Wisconsin in Madison, and is an American Society for Quality Certified Quality Engineer.

Dawn Thomas received her Bachelor of Science degree in Environmental Science from Salish Kootenai College in 2001. In the summer of 1998 as an internship student, she was hired to start a native plant nursery and environmental restoration program under the supervision of Virgil Dupuis. Dawn now grows native plants for the Confederated Salish and Kootenai Tribes' restoration projects. She is also writing a native plant growing manual for the Tribal Forestry Department.

Chris Thompson is a Senior Associate with Environment International, Ltd., based in Seattle, Washington. He currently works primarily on ecological risk assessment of superfund sites in the Columbia Basin (Portland Harbor and upper Columbia River). He received his B.S. degree in Biology from Princeton University (1980), M.S. degree in Zoology from the University of Texas at Austin (1985), and Ph.D. degree in Zoology from Arizona State University (1990). He held positions as postdoctoral Fellow at the University of Washington (1991-1995), and Research Scientist for the Washington Department of Fish and Wildlife (1995-2003), and University of Washington (2003-2005), where he conducted research on seabird ecology, especially regarding sea-bird-fisheries interactions.

Clifford E. Trafzer is Professor of American Indian History at the University of California, Riverside, where he is also Director of the California Center for Native Nations. He has worked with the Twenty-Nine Palms Tribe since 1997, and he has published *Chemehuevi People of the Coachella Valley* with the tribe. He has also written *Native Universe: Voices of Indian America* with the National Museum of the American Indian. His paper with Willard Gilbert and Anthony Madrigal has been accepted for publication in a forthcoming special issue on Native Americans edited by James Fenelon in the *American Behavioral Scientist*.

Christa Tyrell manages the Nonpoint Source Pollution Control Program for the Fort Peck Tribes Office of Environmental Protection (OEP). She has worked for the Tribes as a hydrologist for the last five years, after receiving her M.S. degree in Geology from the University of Montana. Over the course of the last eight years, she has had experience in computer modeling of groundwater and surface water systems and interactions, as well as regional and local flow systems, capture zones, groundwater recharge, and surface water issues, including sediment and nutrient load quantification and reduction, and point and non-point sources of contamination. Her environmental software program experience and database management work for the Tribes lends itself to her role as a member of the Region VIII Peer Training Network.

Vi Waghiyi is a St. Lawrence Island Yupik who was born and raised in the Village of Savoonga on St. Lawrence Island, Alaska. St. Lawrence Island is located in the Bering Sea in Northwestern Alaska. Her people live a subsistence lifestyle off the land and ocean. She and her husband have four boys and live in Anchorage, Alaska. She was hired by ACAT in October 2002 to work as an Assistant Coordinator on the Environmental Health and Justice Project for St. Lawrence Island and became the Coordinator for the

project in 2004. The ongoing research for the St. Lawrence Island Project includes a Traditional Food Study and a Human Health Survey. Ms. Waghiyi is now coordinating the Environmental Health and Justice for Norton Sound, Alaska. The project will continue our work on St. Lawrence Island and include the 15 communities in Norton Sound, Alaska. Before coming to ACAT, she held a variety of positions in Nome, Seattle, and Anchorage in multicultural settings in positions of accounting, management, and customer relations.

Claudia Walters works in the Sustainability Program for the U.S. EPA Office of Research and Development. She collaborates across EPA and with state, local, and tribal governments, and universities to identify sustainability priorities, develop partnerships, and implement projects. While at EPA, she has worked in several program offices and a region, including the Chesapeake Bay Program Office. She has worked on several of the EPA's sustainability programs, including the Sustainable Development Challenge Grants, Brownfields, Community Based Environmental Programs, Community Assessment, and Smart Growth.

Currently she is leading an agency effort to initiate a dialogue across the Agency on developing a common agency vision on sustainability. Her main sustainability interests are social science issues, including cultural dimensions, systems thinking, comprehensive, multi-level planning, and K-12 educational school curricula. She has conducted both human and ecological research at the Department of Agriculture and Interior.

Ms. Walters was instrumental in the formation of the National EPA-Tribal Science Council and served as its Executive Secretary until the spring of 2006. Her academic background includes an M.S. degree in Marine, Estuarine, and Environmental Sciences and a B.S. degree in Agricultural and Analytical Chemistry.

Therese Waterhouse is an Instructor/Research Scientist in the Department of Nutrition and Exercise Sciences at Oregon State University (OSU). She has been a registered dietician for more than 15 years, has evaluated dietary adequacy for various age groups, and teaches human metabolism at OSU. She serves as a clinical dietician for the regional education service district and has been a nutritional consultant for Head-Start for more than five years. Her research interests are in the area of adaptations of diet to variations in environmental situations, subsistence diets, and dietary adequacy in less-than-optimal situations. This includes the evaluation of dietary contributors of toxics exposure. She has completed a fellowship in pediatric nutrition and is involved in development of community-based nutrition interventions. Dr. Waterhouse has a Ph.D. degree from the University of Alabama at Birmingham in Nutrition Biochemistry.

Gretchen Watkins is the water resource specialist/hydrologist for the Lac du Flambeau Band of Lake Superior Indians. She received her B.S. degree in Biology from Rensselaer Polytechnic Institute and her M.S. degree in Environmental Engineering from Michigan Technological University. Ms. Watkins oversees the Lac du Flambeau water resource program that develops and executes sound scientific investigation to support management decisions. These decisions attempt to protect and restore Lac du Flambeau water resources for the next seven generations.

Hilary Elizabeth Wendt is currently a Tribal Program Specialist in the Program Operations and Integration branch of the Office of Policy and Management at the U.S. EPA Region 7. She graduated with a Bachelor of Science in Environmental Studies, with an emphasis in Geosciences, and a minor in Geology from the University of Missouri at Kansas City (UMKC). She has worked for UMKC as the Geosciences Museum Coordinator/Environmental Science Lab class instructor, a land use planning firm called Planning Works, and joined the EPA R7 Tribal Program Office in 2001. She graduated from the EPA Intern Program in 2003 after performing several details/rotations throughout the Agency and then

continued working with federally recognized Tribal Governments. She is currently a Project Officer for Indian Environmental General Assistance Program grants, R7 Tribal Science Council Alternate, the Environmental Stewardship and Sustainability representative for R7's EMS Program and, among many other projects, is the coordinator for R7's Working Effectively with Tribal Governments training.

Dana L. Wetzel graduated from Texas A&M University with a degree in Biochemistry in 1979. She received her M.S. and Ph.D. degrees in Chemical Oceanography from the University of South Florida in 1995 and 2000, respectively. Her research during graduate school and since has focused on assessing chemical contaminants in the marine environment, determining lethal and sublethal effects of such exposure, and developing methods that use lipids as biochemical markers of health. Dr. Wetzel has worked for the Mote Marine Laboratory since obtaining her doctoral degree; she is currently a Senior Scientist and the Program Manager for Aquatic Toxicology. In addition to her work in Florida, she has developed research programs in the Mediterranean, the Caribbean, and the Arctic. Dr. Wetzel has published in a variety of journals and is an award-winning educator.

Dave Wilcox is a senior vice president for Gold Systems Inc. For more than ten years, he has provided environmental data management consulting for private industry, federal agencies, states, tribes, and volunteer monitoring programs. He is currently working on data management solutions for tribal programs in EPA regions 5, 6, and 8.

Daniel R. Wildcat is a Yuchi member of the Muscogee Nation of Oklahoma. He is the Director of the Haskell Environmental Research Studies (HERS) Center and a American Indian Studies faculty member at Haskell Indian Nations University in Lawrence, Kansas. Dr. Wildcat received his B.A. and M.A. degrees in Sociology from the University of Kansas and an interdisciplinary Ph.D. degree from the University of Missouri at Kansas City. He has taught at Haskell for 20 years.

Dr. Wildcat has been an invited speaker on North American Indian worldviews at Harvard Medical School, Creighton University, University of Kansas Medical School, Kansas State University, University of California (Riverside), and many other institutions of higher education. He is frequently asked to speak to community groups and organizations on the issue of cultural diversity. In 1992, Dr. Wildcat was honored with the Heart Peace Award by the Kansas City organization The Future Is Now for his efforts to promote world peace and cultural diversity.

Dr. Wildcat also helped plan and design a four-part video series entitled "All Things Are Connected: The Circle of Life" (1997), which dealt with land, air, water, and biological issues related to environmental science and policy issues facing Native nations. He is the author and editor of several books: *Power and Place: Indian Education In America*, with Vine Deloria, Jr.; *Destroying Dogma: Vine Deloria's Legacy on Intellectual America*, with Steve Pavlik; and a new book, *Red Alert: Saving the Earth with Indigenous Knowledge*, available spring 2007.

Terry Williams has been employed with Tulalip Tribes Natural Resources for 25 years as the Director of Fisheries and the Fisheries and Natural Resources Commissioner. He was appointed for two years by Ms. Carol Browner, Administrator of EPA to establish a new office with EPA to specifically address environmental issues of Indian Tribes nationwide. He also was appointed to the Northwest Indian Fisheries Commission since 1985, Vice-Chairman from 1992 to 95, and Pacific Salmon Commission, Southern Panel from 1985 to present. He has chaired the panel for six of these years. He was selected by Washington and Oregon Treaty Tribes and appointed by the U.S. Department of the Interior to represent Tribal interest in the U.S.- Canada Salmon Interception Treaty annual salmon harvest management and allocation deliberation at negotiations. He is a representative since 1986 to present on the Pacific Management Council for the Tulalip Tribes United Nations Conference on Biodiversity-U.S. Delegate since 1997. He was appointed by the Secretary for Policy and International Affairs Office Department of

the Interior to represent Indigenous Peoples of the United States delegation to the United Nations Conference on Biodiversity, and to the International Association of Impact Assessment Indigenous Peoples Committee where he is Co-Chair since 1997.

Mr. Williams received his A.A. degree in 1977 from Everett Community College in Criminal and Law Enforcement. He graduated with a B.A. degree in 1979 from Central Washington University in Law and Justice.

Kimberly Winton was born in Oklahoma, and has a B.S. degree in Zoology and an M.S. degree in Agronomy from Oklahoma State University. Her Ph.D. degree is from the University of Arkansas (Agronomy). Most of her professional career (15 years) was spent in the agrichemical industry, where she gained experience in biological research, agricultural practices, and environmental fate and effects of pesticides. She spent five years conducting field biological research in Greenville, Mississippi, then ten years in Greensboro, North Carolina, contracting environmental field, laboratory, and analytical research. She also worked for an environmental consulting company for two years and worked on a contract for the EPA National Groundwater Risk Management Laboratory in Ada, Oklahoma.

For the past 4 years, she has been the Director for the U.S. Geological Survey (USGS) Oklahoma Water Science Center. She has a staff of approximately 45 and a program of approximately \$5 million. Last year, the Oklahoma Water Science Center provided classroom instruction in water quality sampling for 30 tribes. Her personal interests involve anything outdoors. She and her husband have 45 acres in Shawnee, Oklahoma, where they have four horses, twelve miniature donkeys, four dogs, a huge garden, lots of fruit and nut trees, and they are developing a small vineyard. Ms. Winton is of Cherokee and Chickasaw heritage (and Irish and French).

APPENDIX D

Summary of Written Feedback Received from Conference Participants

National Tribal Forum on Environmental Science
September 24-28, 2006
Ocean Shores, Washington

Summary of Written Feedback Received from Conference Participants

This appendix summarizes the written feedback received from participants who attended the National Tribal Forum on Environmental Science held on September 24-28, 2006 at Quinault Beach Resort and Casino in Ocean Shores, WA. Trends within responses to evaluations gauging the success of the overall conference and specific trainings sessions are encapsulated below.

A conference evaluation form was designed and distributed to capture participant feedback on various aspects of the conference including overall impressions, suitability, utility, and practicality (from a tribal perspective) of the technical sessions; quality of speakers and trainings; forum design and execution; and interest in and suggestions for similar events in the future. The Forum received excellent feedback on its overall structure with over 90% of respondents stating that it met their expectations and provided good networking opportunities. The vast majority of respondents thought that it struck an appropriate balance between scientific research methods and practical application at the tribal/community level. Additionally, 82% of those who submitted responses also indicated that the Forum presented new ideas for improving environmental and human health standards in their communities. Several individuals provided supportive comments regarding the Forum and expressed satisfaction that it was not dominated by EPA representatives. Most respondents seemed to view this as the first of many Forums. Some helpful suggestions to improve future conferences included recommendations to conduct further outreach to tribal communities and encourage tribal staff to make presentations, staggering concurrent sessions to avoid conflicts, striking a balance between natural resource issues/health issues, and assistance in the development of regional data coordination and analysis. The Forum also received top marks on design and delivery with 100% of respondents approving it on concept and 83% on agenda. Likewise, the content at the Forum proved to be very popular with the poster session, breakouts, and field trips receiving overwhelming approval from all respondents. Additionally, keynote addresses from both Lydia Olympic and Oren Lyons received very high scores while all respondents found the Forum presenters and trainers to be effective and the key Forum messages well-communicated. Of the tangible items presented at the Forum, 100% of respondents found the meeting materials and associated products to be well-presented. Finally, in response to the question on their degree of interest in participating in similar conferences in the future, the 15 participants who answered this question all responded enthusiastically. Although the sample size is small, if the responses reported here are assumed to be representative of the majority of Forum participants, it is likely that the majority of participants would be very interested in and highly motivated to attend another Forum.

The following sections describe the response to the four major themes of the Forum: air, water, earth, and water and community health.

Air

The four air sessions combined received a very high approval rating from the 32 participants who provided written feedback. Over 90% of respondents stated that the sessions had met their expectations and needs as tribal representatives, and that it was a worthwhile use of their time and organizational resources. Likewise, the sessions scored 90% and upwards on course content and course materials. Course trainers received 95% approval ratings on their knowledge and responsiveness to questions and 100% approval on presentation style and the overall course message and expectations. The Air Pollution Transport session was reviewed by three participants and received an overwhelmingly positive response on course content, materials, presenter knowledge, and style as well as message. Glen Gehring, the speaker on 'Identifying Transport Pathways Using the HYSPLIT Model,' was mentioned as being

particularly effective. Respondents stated that the session demonstrated new tools and allowed tribal programs to share information. Seven participants submitted evaluations for the Indoor Air session which was rated in the 'good-superior' range on content, presenter knowledge, and delivery, as well as course message. All respondents stated that the course met their expectations with supportive comments indicating that the session offered practical solutions to tackling problems like mold and providing factual data to bring back to communities. In particular, the 'Mold: Mycotoxins, Indoor Air Health Crisis in Indian Country' presentation by Curtis Munoz was rated very highly. The Air Deposition session was graded by 14 individuals and received 100% approval on design concept and 83% approval on course content and presentation materials. The presenters, and Larry Mercurieff in particular, the speaker on 'Alaska Native Science,' received very high marks. Respondents stated that the presentations gave them a good understanding of mercury issues and how to communicate these to tribal members but added that they would like to receive basic introductory training on this topic and suggested adding monitoring/instrumentation to the curriculum. Respondents failed to provide feedback on two additional presentations.

Water

Eleven participants reviewed the water session. Over 89% of these individuals stated that the sessions met their expectations and needs as tribal representatives and was a worthwhile use of their time and resources. The sessions received 100% approval on course design and presentation materials, while presenter knowledge and presentation style scored 83% and 67% respectively. Additionally, presenters scored 100% on responsiveness to questions. The presentation on 'Potential Effects of Suburbanization on the Water Quality and Quantity of Boiling Springs, a Sacred Area to the Shakopee Mdewakanton Dakota Community, Scott County, Minnesota,' was scored by one individual and received top marks across the board on course design, content, and execution. The respondent stated that he would consider the list of parameters for short/long term goals for monitoring and added that more statistical graphs could have been included to highlight trends. 'The Development of Water Quality Standards on the Pyramid Lake Paiute Indian Reservation' presented by Daniel Mosley was also mentioned as being particularly memorable. The Data Management for Water Monitoring training was evaluated by 16 participants and received over 75% approval on course expectations and utility. The training scored 92% on concept, 100% on course materials, presenter knowledge, and presentation style while the course message received 83% approval. Respondents commented that they found the experience sharing by field technicians and data collection spreadsheet to be beneficial and requested a user guide on this topic. Unfortunately, many of the other presentations were not reviewed individually, however, respondents stated that they especially enjoyed the water sessions because they showcased tribal projects that could be used to promote similar projects in their communities. Other comments indicated that the presentations could have made a better connection between data and cultural needs/goals/perspective.

Earth

The earth session did not rate as highly as anticipated among the ten participants who responded to the evaluation. Only 60% stated that the session met their expectations, 50% stated that the session met their needs as a tribal representative, and 70% said it was a worthwhile use of their time and resources. Course concept received a perfect score while course materials, presenter knowledge, and style all received an 89% approval rating. However, the session was not rated strongly, at 67% in course content, clarity, and relevance as well as course message and expectations. Four participants evaluated the 'Invasive Species Impacts in Indian Country' presentation, which garnered top marks for content, course visuals, trainer knowledge, and presentation style as well as course message. One additional comment regarding this presentation was a request for the addition of case studies. The 'Mercury Contamination of Cheyenne River Sioux Land' presentation was reviewed by two respondents who felt that it lived up to expectations in all categories. Although the 'Tribal Emergency Management' training also had feedback from two participants, it was difficult to draw any conclusive opinions regarding the success of the training due to conflicting responses. The only area where there was agreement was on the high score for course concept. A suggestion was also made to limit the scope of the presentations. The 'Risk Assessment and EPA/Lifeline' training was reviewed by four individuals who stated that the training met their

expectations. Two said that the session met their needs as a tribal representative and all four agreed that it was a worthwhile use of their time and resources. The training received a 75% approval rating on course concept and visuals, while the trainers and course message received 100% approval. Respondents added that it was beneficial to see how different aspects tied into risk assessment and that they would use the training to develop tribal risk assessment programs, enhance fish studies in their communities, and recommend the UST program for setting priorities within their organizations. The ‘Introduction to Natural Resources Damage Assessment and Restoration (NRDAR)’ training was evaluated by one participant who gave it an overall ‘good’ score on content, presentation, and message. Supportive comments included the training’s focus on population growth and sustainability but warned against lengthy presentations that strayed from the topic. The remaining presentations in the earth track were not specifically evaluated.

Water and Community Health

The water and community health session was evaluated by 15 participants and like the earth session did not rate as well as expected. The session was rated favorably by 71% of participants on course expectations, 69% on meeting tribal representative needs, 57% on utility, and 62% on being a worthwhile use of organizational resources. The session ranked highly with respect to course concept, visuals, and presentation but fell short in course content and relevance. The ‘Source Water Protection Planning in a Shallow Alluvial Aquifer’ presentation was reviewed by three participants with high marks across the board for design and delivery. Dale Becker and Samuel Iwenofu were identified as excellent speakers. Four participants scored the ‘Potential Contribution of the Burden of Disease and Injury to Assess Community Health in Indian Country’ presentation which received an overall good score on concept, presentation, and message, though one respondent said that it could include more tribal data. The ‘Emerging Issues, Contaminants in our Environment, Endocrine Disruptors, Pharmaceuticals, and Personal Care Products’ presentation was also reviewed favorably by four respondents. The ‘Overview of Water Quality Standards from a Tribal Perspective’ training was evaluated by seven participants and received over 80% approval on utility, course concept, and presentation. Comments indicated that respondents really benefited from the tribal perspective and the TAS process and implementation. The ‘Overview of Science Grants and Tips for Successful Tribal Proposals (Includes PART)’ training received 10 evaluations. Based on the evaluations, 90% of respondents stated that the session met their expectations. Course concept and presenter style received similar high marks. In addition, respondents commented on the logical format of the training and the use of ‘first-person’ experiences to illustrate lessons. As with other sessions not all presentations in the water and community health session were independently evaluated.